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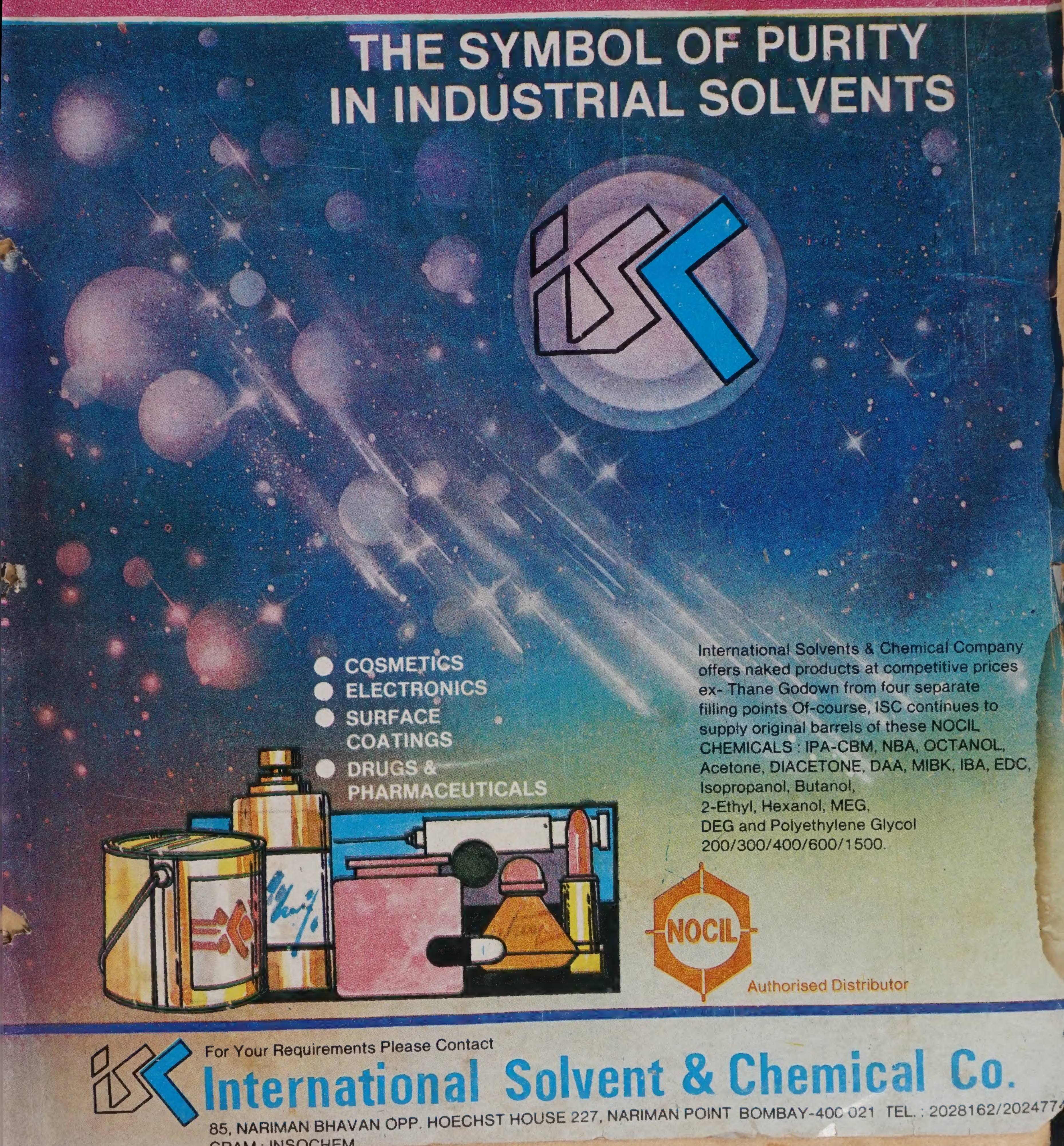
34th
YEAR OF
PUBLICATION

Chemical Weekly

VOL. XXXIV APRIL 18, 1989 NO. 32



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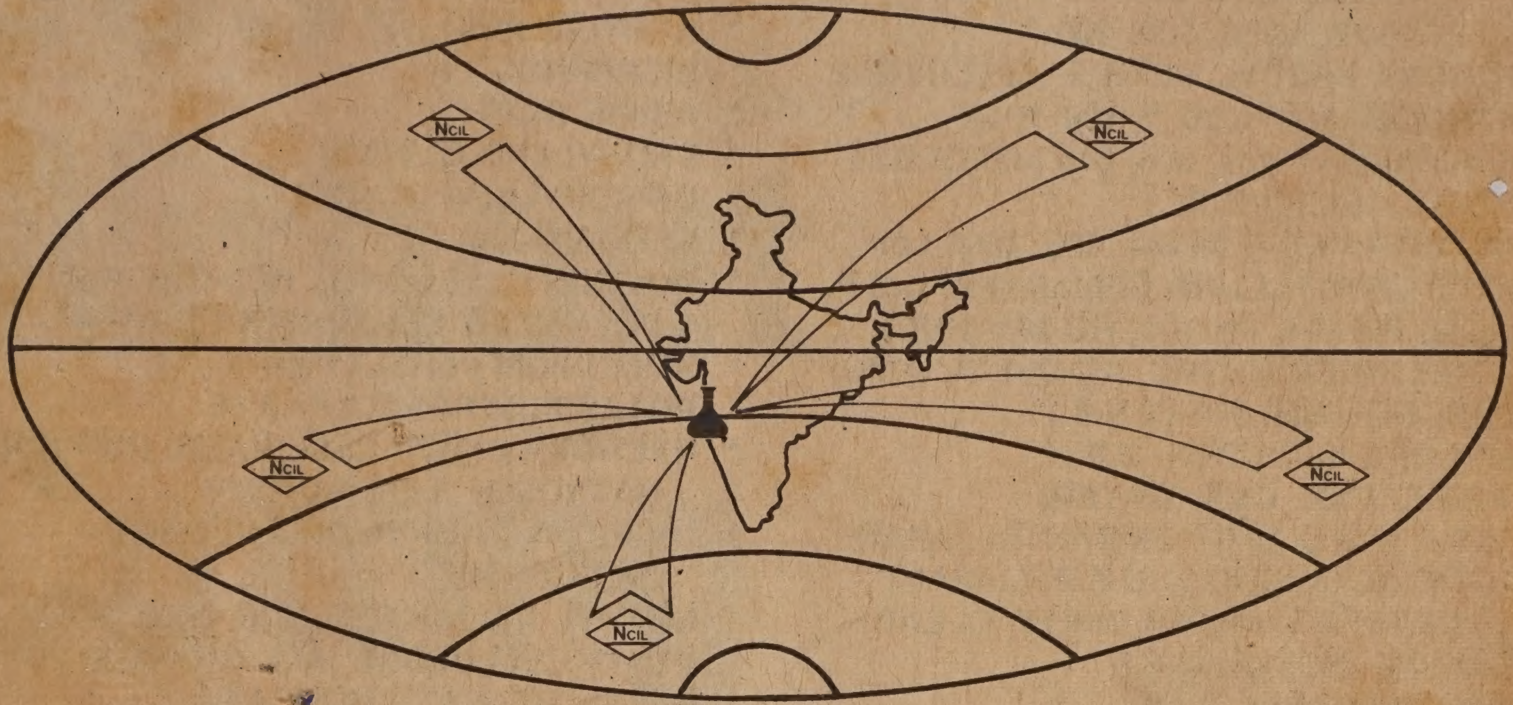

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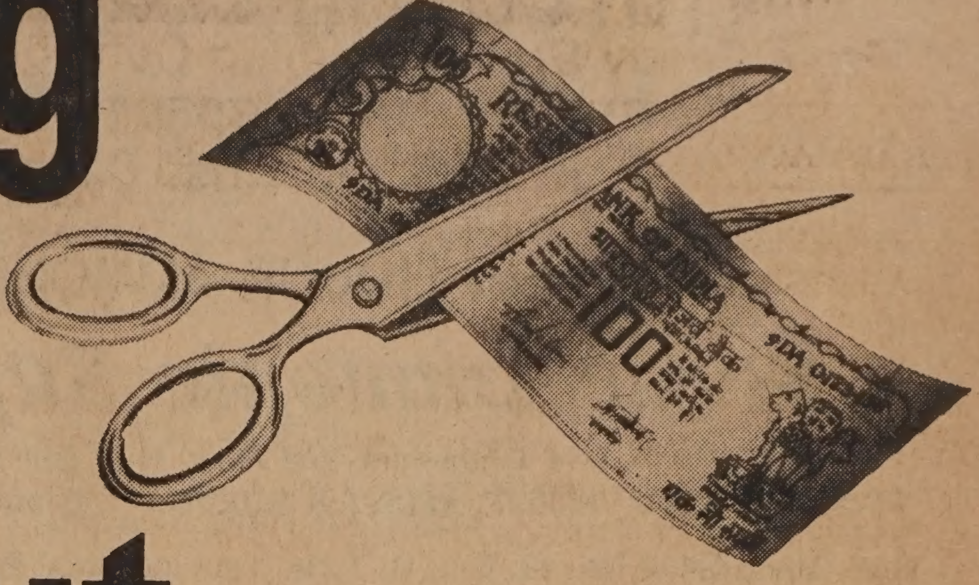

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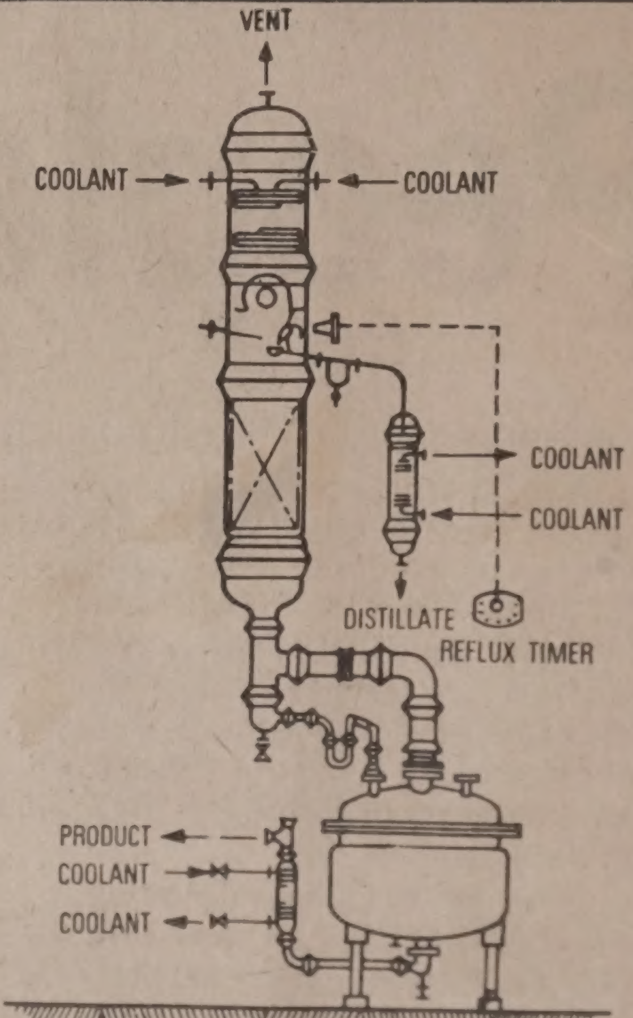

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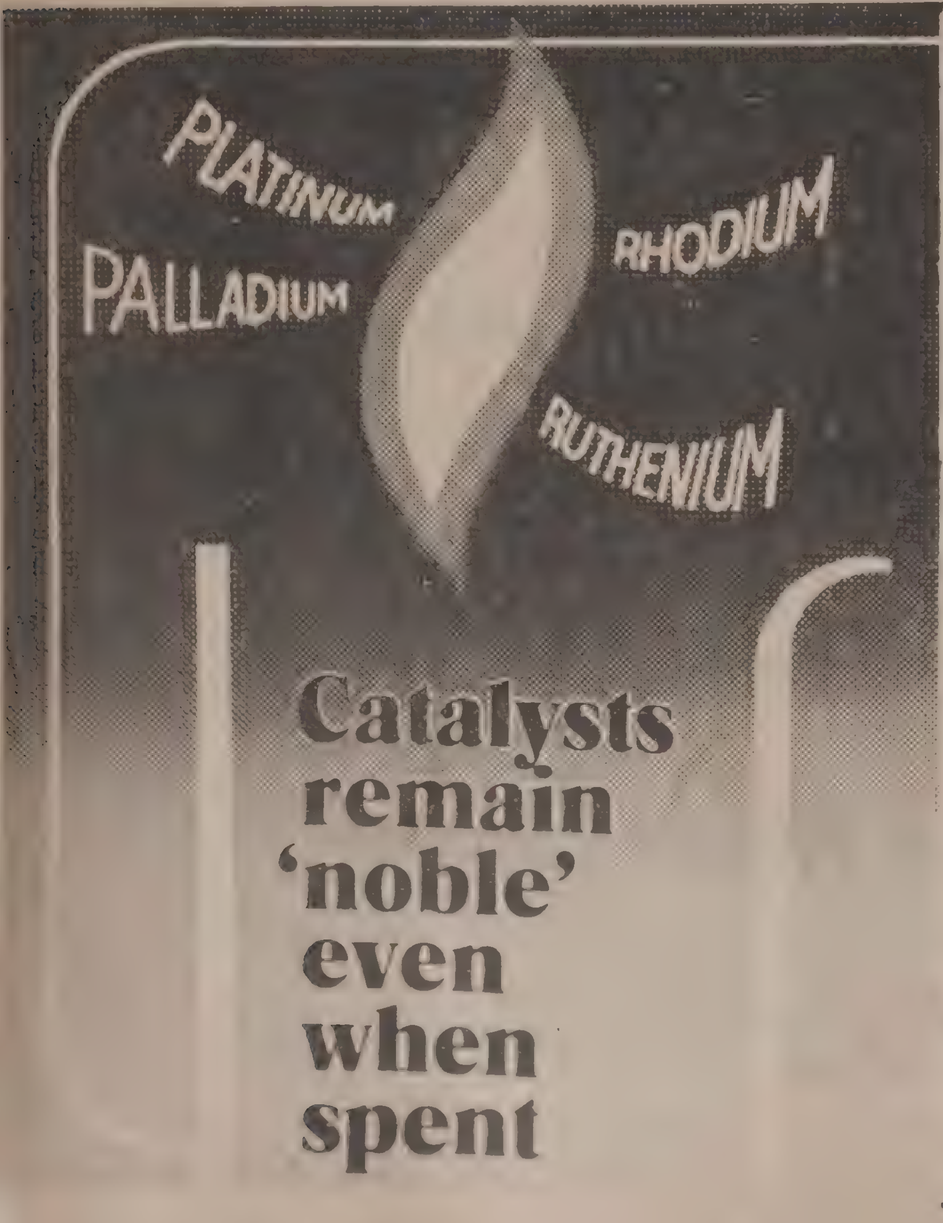

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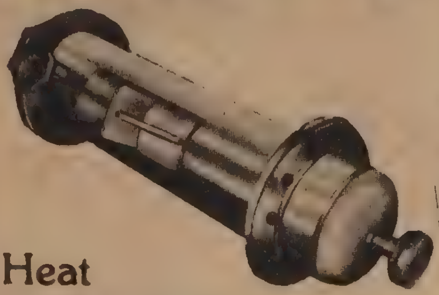

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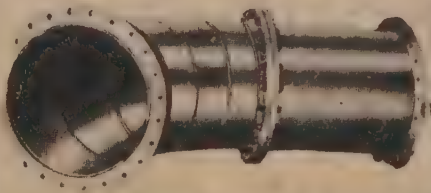

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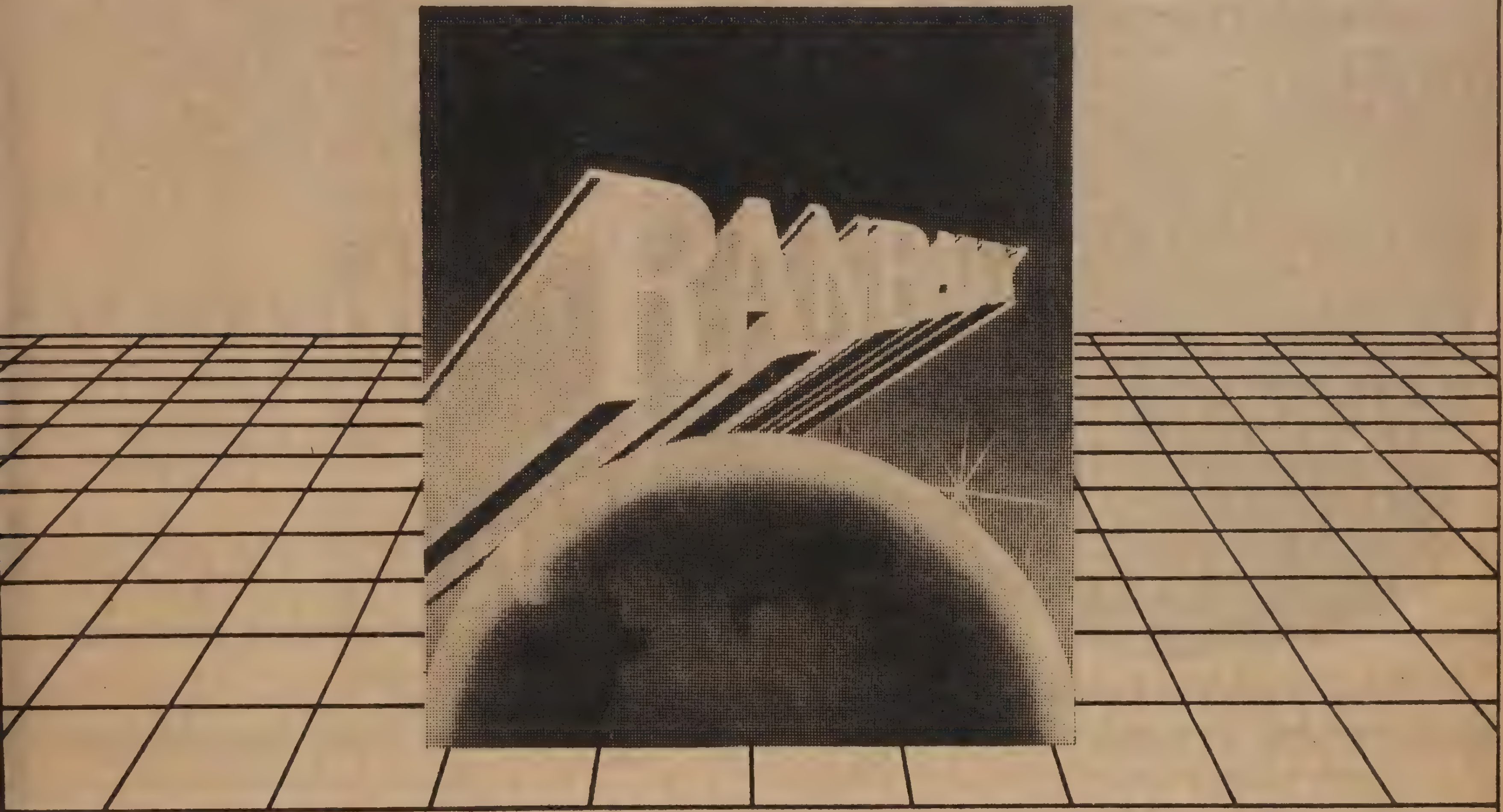

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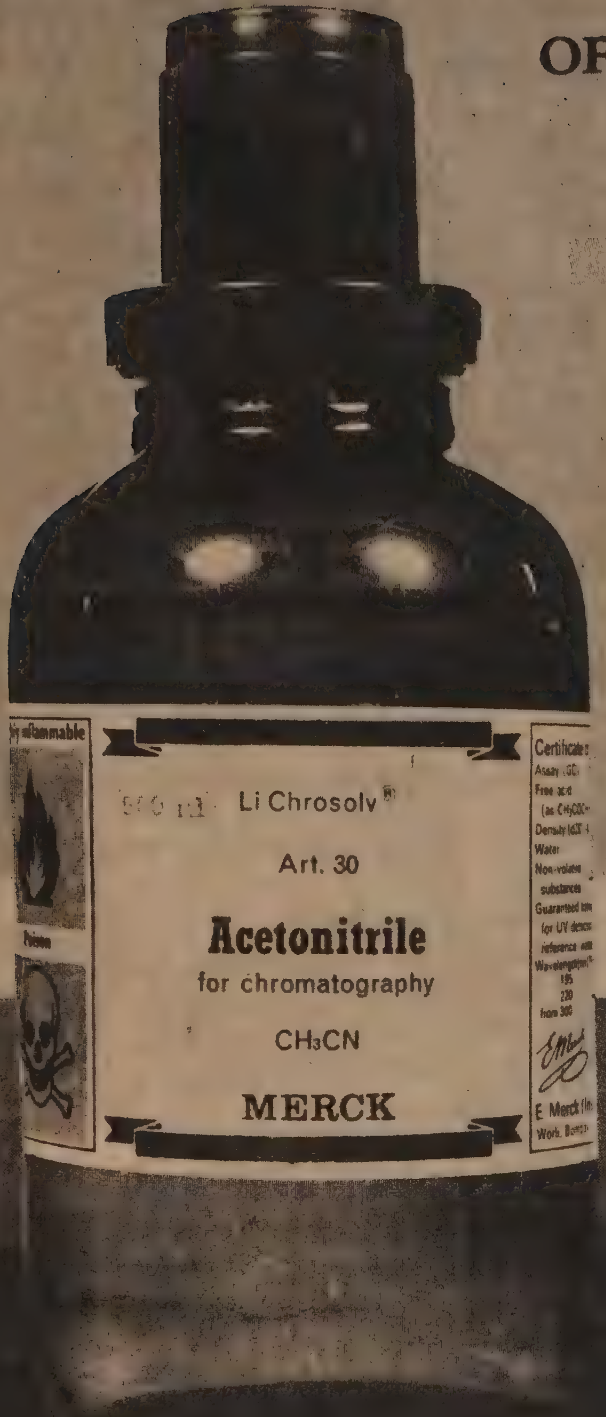
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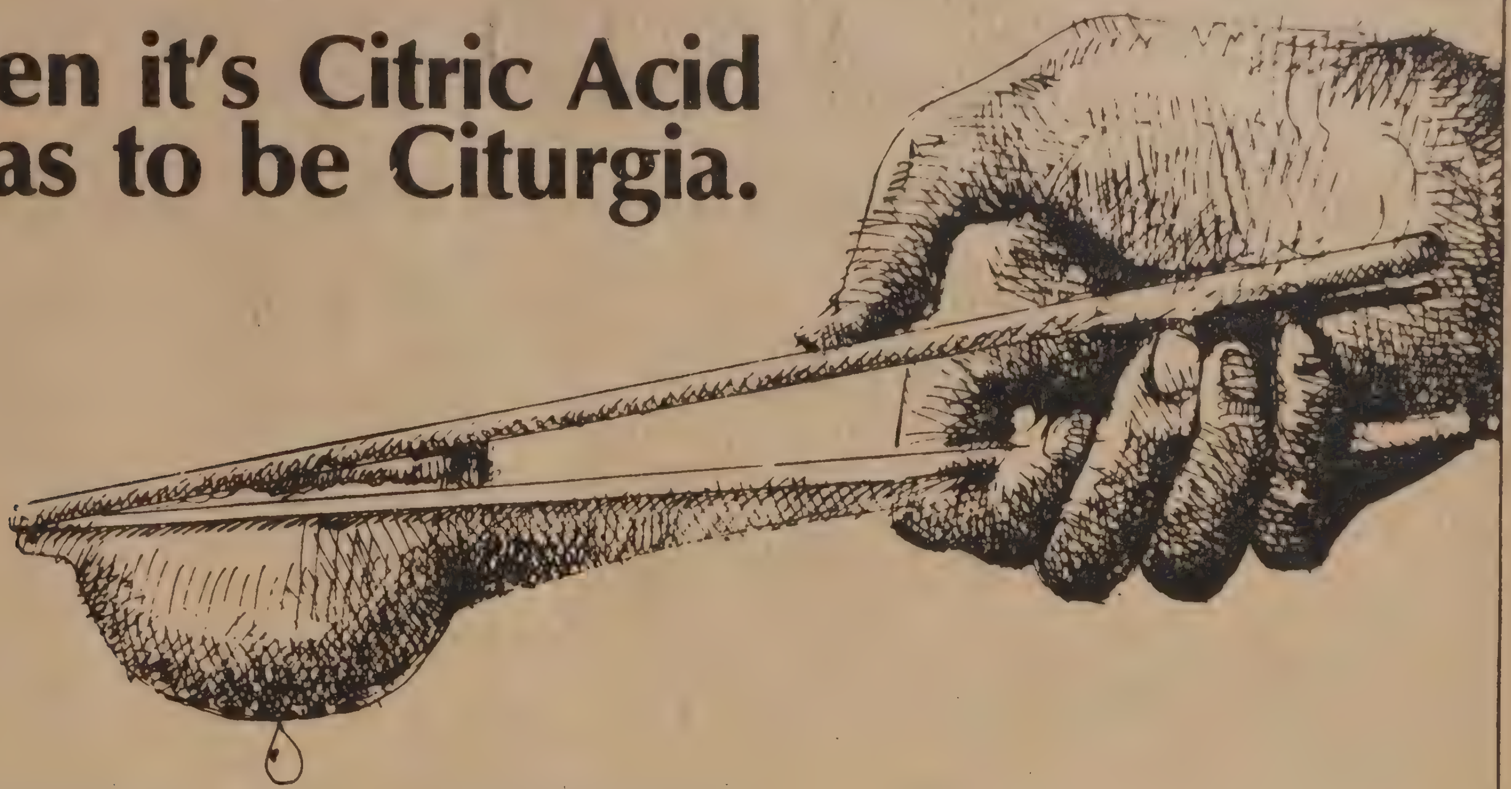

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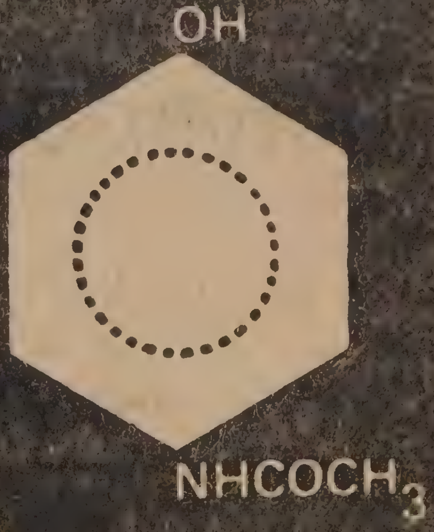

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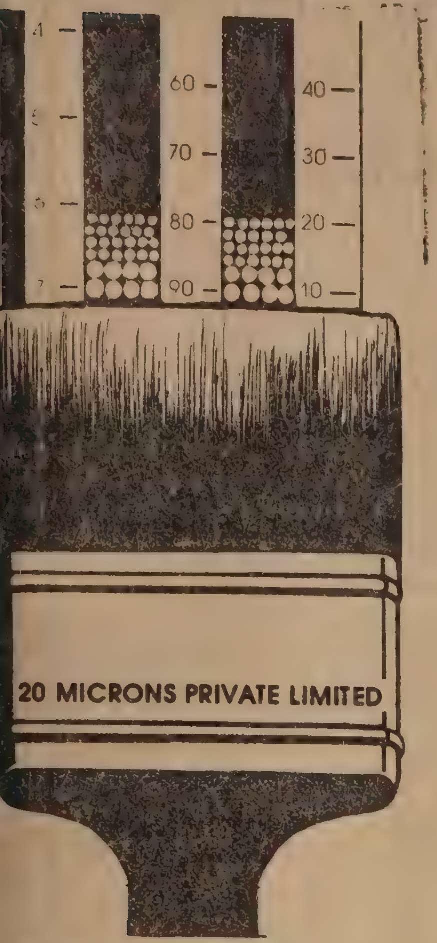

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CHEMICAL
WEEKLY

VOL. XXXIV APRIL 18, 1989 NO. 32

HERALDING THE 21st CENTURY - 16

Saga in Space — Man's never ending Quest

The physicist, Gerald O. Neile believes that the biggest economic benefit of space in the forseeable future is that might replace civilisation's dependence on fossil fuels. Peter Glaser has shown that solar energy can be efficiently conerted to electricity in space and transmitted to Earth as microwave beams. It is likely that within 25 years we will ee practical solar power satellites in orbit, exporting energy o Earth. To astronomers, the Earth itself is growing increasngly polluted with interference. The back of the moon is proably the best place to set up observatories to observe the est of the universe, since the side facing permanently away rom the earth is free from interferences.

The ultimate value of the moon is its enormous stockpile f natural resources. The astronauts reported that the moon ontains such strategically valuable materials as titanium -- space age metal. Lunar rocks contain oxygen which could e used to supply a settlement on the moon. The moon may e the ideal place for long term industrial development. It s cheaper and easier to get resources of the moon and into he space than launch them from earth. The moon can become he common heritage resource for all mankind. Every metal needed by the civilisation on Earth is available in abundance on the moon to supply the earth for the foreseeable future. Plants will grow well in moon dust and it should not be long before we establish farms and parks there. The moon will probably become the favourite recreation park of earthlings whose visit to the moon will become as normal as the one o Europe or America.

On the moon, solar energy would work well for the two weeks when the sun is in the sky. But during the long night energy would have to come from other sources like fuel cells. A fuel cell is a type of storage battery developed for the space programme. One way the lunar dweller could use fuel cells would be to take advantage of the reversibility in the reaction combing oxygen and hydrogen. During the long lunar day extending nearly to fifteen earth days, they could use solar energy to break down water into hydrogen and oxygen. Thus during the equally long night, the hydrogen and oxygen could be recombined in the fuel cells to produce the energy needed to run everything till solar energy becomes available again. Fuel cells are thus a clean non-polluting way of getting two essential supplies of electricity and water. One day we may use such fuel cells as transportation energy on earth.

Similarly in Mars, where the atmosphere consists of carbon dioxide, the fuel cell would break down the carbon dioxide to carbon monoxide and oxygen. This in turn could be used as rocket fuel. Most asteroids mainly orbit between Mars and Jupiter. Although physically located much farther away from the moon, they are closer in terms of the amount of energy required to get there and back. An unadulterated chunk of the asteroid would often be a clue not just to the formation of the planet but to the very origin of life itself. It is the closest thing to the time machine for the study of our cosmic roots.

More than 2000 asteroids have been located and undoubtedly many thousands more exist. Some are made of rock, some surprisingly of a nickel iron alloy and some others of a substance like tar being high in carbon content. One guess is that perhaps it is these carbon compounds that contributed to the formation of life on Earth. One day we may find it easier, cheaper and environmentally less damaging to the earth to mine metals and other necessities in space from asteroids or the moon and ship them back to earth. There would be no need to strip mine the earth if we learned to use all the resources waiting out there, waiting to be taken off the strip. On the surface of Mercury, meteoroites have a written record of the formation of the solar system and by comparing them with the craters on the Moon, Mars and other planets, we begin to see the differences in the conditions that existed when the planets were formed.

Pioneer 10 is at this moment, truly living upto its name, flying into the edge of unexplored interstellar space to be followed in the next few years by Pioneer 11 and the two Voyagers. Interstellar Spaceships have long fascinated scientists and science fiction writers but certainly there will be no interstellar astronauts in the next 25 years. The distances are too vast and the present technology too limited. However there is a good chance there will be further robotic interstellar probes during this period. There are projects operating at the present moment that sound like science fiction but are really scientific facts. One endeavour is called the search for extra terrestrial intelligence and its discipiles have a very good chance of succeeding within the next two decades. One of them called TAU, is being closely scrutinized by JPL and could be the first probe deliberately designed to explore interstellar space. The other, Starwisp has been proposed by the remarkable scientist, Robert L. Forward and is the logical candidate for the second. The quite reasonable conclusion is that by the middle of the next century we may be able to afford to build starships.

TAU stands for Thousand Astronomical Units. One astronomical unit is the distance of the Earth from the Sun (93 million miles). The distance to the stars is unimaginable. At the speed of Pioneer 10, it would take hundreds of centuries to reach the Sun's nearest Stellar neighbour, the triple star system -- Alpha Centauri. Ten Mu the 13th century Chinese Philosopher wrote "Heaven and Earth are large; yet in the whole of space they are but as small as a grain of rice. It is as if the whole of empty space were a tree and heaven and earth were its fruits. Empty space is like a kingdom and heaven and earth are no more than a single individual person in that kingdom. Upon that tree there may be many fruits, and in one kingdom may people. How unreasonable it would be to suppose that besides heaven and earth which one can see, there are no other heavens and no other earth".

The Search for Extra Terrestrial Intelligence (SETI) is on in the US and USSR. There may be many methods for communication by using techniques unknown to today's science but if alien society wants to communicate with any one, not just the most advanced beings, it will have to be a technology known to all civilisations and radio is probably the most primitive means for the job. Thus in 1960, astronomer, Frank Drake conducted the first modern search for artificial radio signals from another civilisation. He called it Project Ozma, after the Queen of the Land of OZ. The SETI projects stand out in the US. One of the longest running SETI programme is at the Ohio State University. The Planetary Society is borrowing time on Radio Telescopes and in 1983, the Sentinel programme has been turned on scanning the sky on 131,000 radio channels. Harvard University is now running META, the Megachannel Extra Terrestrial Assay, which is regarded as a quantum leap over the Sentinel.

The Russians have conducted several searches on their own and have a Radio telescope at Samarkand, working part time on SETI. In addition, Russians have also a plan to launch a radiotelescope into orbit that will spend part of its time on SETI. Canada, France, West Germany, Holland and Australia have all conducted SETI programmes. Japanese have proposed a 150 foot diameter radio telescope, one of the best in the world, located at Nobeyama. In the southern hemisphere, Australia and Argentina are the only countries experimenting on SETI.

McDonnough, author of the book on "Space -- The next twenty five years", is of the view that the chances are excellent that within the next twenty five years some one will find indisputable proof of an extra terrestrial civilisation. The simple knowledge that we of the earth are not alone will affect our thinking more radically than Sputnik. Suddenly it will be hard to take seriously the differences between America and Russians, Arabs or Jews, when compared to the "litt Green Men" from beyond. In the long run, the Solar Syste will be our playground and our living room. Several of th moons and planets can be transformed "terrafarmed" into compatible world with the technology available. The first t be so converted may be our own moon. There are proposal to provide over a period of many years a breathable atmos phere of oxygen on the moon.

Mars and Venus will be the next candidates for terrafarming into habitable worlds. Since they have carbon dioxid atmospheres, this could be converted into oxygen, in muc the same way it happened on Earth billions of years ago. Mar has water in the form of ice. Venus is a desert where ice wil have to be imported from comets. Momentum is building u for an international human expedition to Mars. Freeman Dysers, physicist of the Institute of Advanced Study, highlights the three important achievements necessary for a successful space venture.

First is genetic engineering. Why should we build a spacecraft instead of growing them? It would be much easier in the long run to use biological organisations to build a spacecraft. Programme the DNA and let the creature grow by itself rather than build it laboriously, one little piece at a time. The second big step in technology will be the development of artificial intelligence. That is the programming of computers in such a way as to be compatible with the organisation of the brain -- so that one can have a creature like the humming bird with a brain weighing a few grams, which can do all sorts of wonderful things. We have to build a machine, which is a sort of hybrid symbiosis of a plant, animal and electronic computer, the three components all working together and the information flowing back and forth between them.

The third technology is just better propulsion systems. Particularly solar based electrical systems. If all the three systems are put together we can have a spacecraft which weighs a kilogram or two instead of tonnes. Once we have obtained a foothold on other worlds, there will be no stopping the human civilization. Even the destruction of the planet will not annihilate our species. We will continue to move to other planets and moons to asteroids and comets and we will build bridges across stars.

Space programme is vital for the growth of human civilisation. Man must have bread and butter but he must also have something to lift his heart. The space programme is clean, and does not harm the environment. We will be unlocking secrets of billions of years old. Without a permanent presence in space, we would be like a man living on a sea shore who occasionally puts his toes in the water and thinks he knows all about the ocean. He never learns about the fascinating creatures that live in the sea and the joys of a ride across the waves or the uses of the ocean for food and resources. And he never knows what he has missed. This certainly is not the history of man and this cannot be his story with regard to space either. **-- T.P.S. RAJAN**

(Source: Space -- The next twenty five years, Thomas R. McDonnough, John Weby).

CHEMARENA

.L. VENKITESWARAN

Methanol-based acetic acid

The project for acetic acid from methanol continues to be the news more recently after the Central Molasses Board eeting. The status of acetic acid in India was reviewed in e **CHEMICAL WEEKLY** (Jan. 3, 1989) and the relevance methanol-based acetic acid referred to in these columns. fter an initial flurry of capacity approvals two years back e question was finally the approval of technology import om British Petroleum, the party who owns it, by GNFC, e party chosen by the licensor for imparting the technolgy as a sole licencee. The proposals reported before Govnment of India for import of technology at over Rs. 8 crores foreign exchange plus about Rs. 25 crores of equipment nd catalysts for a 40,000 TPA plant which may need an overll investment of Rs. 90 crores. This foreign exchange cost enormous when ethyl alcohol technology needs nil.

It is now reported that GNFC is planning to export 50% f production to their collaborator and argue that the quanty of 18,000 tonnes of acetic acid (at 90% capacity utilisation) only will hit the Indian market and therefore will have hardly any repercussion on the production from ethyl alcohol or on molasses utilisation. Earlier there was a report that GNFC was planning doubling of capacity with 50% exports in which case 36,000 tonnes will be for Indian market. Whatever be the quantity for Indian market it is more important to see the price at which it would be sold. Earlier estimates of costs was over Rs. 11.50 per kg. on 40,000 tonnes production. If half were exported at a price of even Rs. 8 per kg, the Indian price will go up to Rs. 15.00 per kg. -- far higher than the costs from ethyl alcohol. The attempts to justify the project only lead to more questions on viability and the necessity for such production in the Indian context.

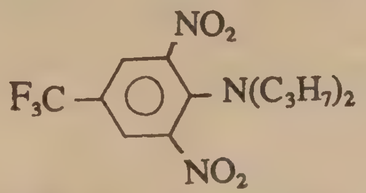
There is an urgent need for clearance of more projects for acetic acid from ethyl alcohol on a priority basis and financial institutions would do well to reexamine their old assessment of GNFC's project and decide on financial clearance of other applications pending with them.

Fluoroaromatics

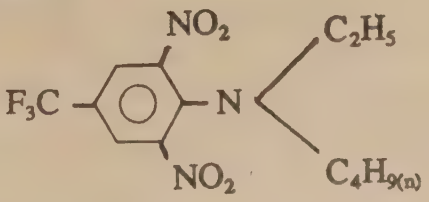
Fluoroaromatics particularly derivatives of trifluoromethyl enzene have been the base for some useful pharmaceutials and pesticides. More recently the fluoroquinolones which ave excellent antibiotic properties have been introduced into he market, particularly norfloxacin. Now there is a build up n fluoroaromatics to meet the increasing demands. Mallinroft Chemicals and DuPont have been the producers in USA nd are said to be doubling their capacities. ICI in UK is also major producer with Hoechst and Rhone Poulenc in Europe. One estimate is that the world demand is about 4,000 tonnes nd expected to grow at a high rate.

The chlorofluoromethanes or CFC's have had a notorious eputation in promoting ozone destruction in the stratosphere and indirectly promoting ultra violet radiation penetration and warming up of atmosphere which could have disastrous consequences. Fluoroplastics Teflon for example, have been very important but CFC's and Teflon are based on simple aliphatic molecules while the bioactive compounds are aromatic or other ring compounds with fluorine as a substituent in the form of trifluoromethyl radical. There is a fluoroaromatic resin however -- PEEK-based on diflurobenzophenone. Some of the fluoropesticides are of an earlier era and most are active herbicides. A few are still used in large volumes particularly, trifluoranil. The important products of this group of herbicides are indicated below:

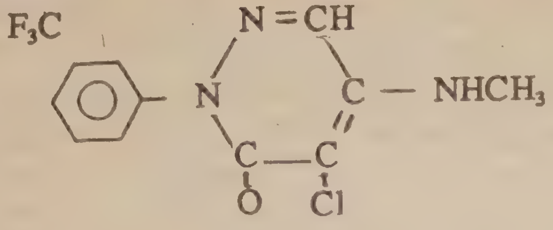
Trifluoranil (Treflan)



Benfluoranil



Norfluorazon



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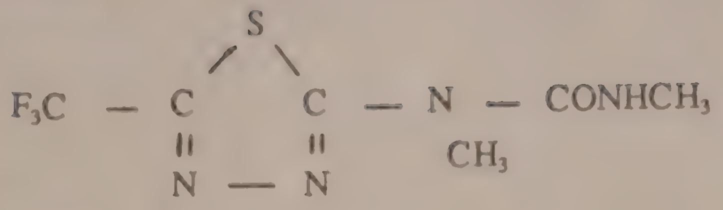
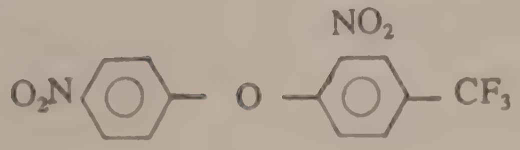


Fluordifen



Bayer seems to have developed a pyrethroid compou with fluoro substituents, Baythroid.

Among the new anti-bacterials, norfloxacin seems to more important and newer compounds are being develope such as Clinosil and mefloxacin. The hydrofluoric acid han ling is the main problem in making flourocompounds. O of the recent anti-malarials is Halfontaine which also has th trifluoromethyl group in a phenanthrene ring. Perhaps Indi should review the recent trends and have a basic programm of R & D in this area.

Polyglucose and fructose from sugar

Dextran, a polymer of glucose and a product of fermentation has been in use for many years as a pharmaceutical. It has not flourished to the extent of early anticipations. But a new method of its production from sucrose (sugar) together with fructose looks to be a breakthrough for lower costs. Biochemists of Aston University (UK) have developed an apparatus with chromato-graphic column with an enzyme dextransucrase for making this polyglucoside dextran. The column is packed with a polystyrene resin and a solution of sucrose is passed continuously down. The dextran formed flows down until and out of the column. As sucrose yields glucose an dextrose and the glucose gets polymerised, the fructos remains behind attached to the calcium ions in the resin an gets eluted slowly. The yields of both products are good bu there are problems in scale up and in getting concentrate products and recoveries. The quality of dextran is said to b good with a molecular weight of about 150000. It is expecte that a 200 kgm of products per cubic metre of resin per hou will be set up for evaluation. The source of the enzyme o costs are not known.

World Watch Institute's annual warning

The World Watch Institute in Washington D.C. serves as a watch dog of the state of the world's environment and repeatedly sends out warnings of the doomsday ahead. It is not about the limitation of world's resources but the way human activities and enterprise disturb the equilibrium and can lead to a situation when recovery may be out of our reach. Apart from the frequent observations on events there is a regular Annual Report on the state of the world. The Report for 1989 has just been published. Lester R. Brown is the president of the Institute and with his assistants and a team of experts brings out the status report or forecast of doom ahead.

The basic observation is that "The deterioration of the Earth's physical condition that we have documented in past volumes is now accelerating" and "there is nothing in prospect that can reverse the trend in the foreseeable future. We are now in a race to stop environmental deterioration before it becomes unmanageable, before it leads to economic and social disruption".

The prognosis is indeed chilling. The threats of climate changes due to "greenhouse gases" or other causes, ozone depletion, destruction of forest cover, unabated population growth, newer diseases like AIDS, pesticidal residues in food and water sources -- the list is endless. Dr. Brown sees the Nineties as critical for steps towards reversal of the degradation of the environment. Public concern has to rise if the era of drought and heat and monsoon disruption is to change. The last year's devastating floods in Bangladesh is sited as an indication of things to come.

The report is said to be getting increasing attention and more people agree that it is no more a case for jokes. Last year's man of the year for *Time* magazine was the "Planet of the Year -- Earth" and there is perhaps more environmental awakening. There is urgent need to --

1. Develop energy strategies that have climate protection as cornerstone;
2. Massive reforestation;
3. Redoubling efforts to meet world food needs;
4. Reducing by half the explosive rate of growth of population;
5. Protecting the ozone layer and reducing the "greenhouse" gases.

World is interdependent but this is not kept in mind in the present political and economic activities.

India has much to think over, particularly on the giant dams that are being taken up and the burgeoning population.

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SALEEMPUR AROMATIC PROJECT

Thapars still in the reckoning

The Singhanias could have got the Project Approval Board's (PAB) nod for the Saleempur aromatic project, but the rival Thapar bid is not yet lost.

The battle for the massive Rs. 900-crore project has presumably reached its final stage, and the Thapars are pushing hard to get the PAB decision reversed by the Union Cabinet.

The Thapar's proposal, it is claimed, has a strong point in that it ensures that there will be no foreign exchange outgo. The Thapars have tied up with the Soviets for setting up the massive petrochemical complex. The Soviets have agreed to provide plant and technology to the Thapars against Indian rupees. The Soviets have even agreed to import technology not available with them in hard currency and provide it to India against rupee payment.

The Union government is reported to be giving second thoughts to projects which entail a heavy foreign exchange outgo. This is in the context of the balance of payments squeeze faced by the government. Therefore, the Thapars proposal may evince fresh consideration, it is suggested.

The Saleempur project will be based on naphtha to be supplied by the Mathura refinery. The project is to manufacture 1,50,000 tonnes of purified terephthalic acid and 1,08,000 tonnes of paraxylene per annum. In addition, the complex will produce 35,000 tonnes of orthoxylene, 50,000 tonnes of cyclohexane and 35,000 tonnes of return raffinate.

It is learnt that the Thapars got into the bidding for Saleempur much later than the others. In fact, their proposal came in only a few days before the PAB was to meet to decide on the proposals for the project. Meanwhile, the Thapars have offered to the government to set up similar projects in the petrochemical field involving Soviet soft financing and equity participation, and entailing no foreign exchange outgo.

The government has in principle decided to set up two aromatic complexes, one in Saleempur in UP and the other in Madras. While the parties for the Madras plant have already been finalised, the Saleempur one is still being debated.

JKMB TO SET UP NEW UNIT

JKMB Limited, belonging to the J.K. Singhania group of industries, is setting up a new unit for the manufacture of organophosphate insecticides and their formulations. The proposed project, which will come up at Ankleshwar, Gujarat, has been approved by the government.

According to official sources, the company proposes to manufacture 500 tonnes per annum (TPA) of organophosphate at an estimated cost of Rs. 4 crores. The company proposes to finance the project by raising Rs. 1.2 crores through its inter-connected undertakings, their directors and relatives and another Rs. 2.8 crores through lonas from the financial institutions.

In its application to the government the company had noted that in the pesticides market, 70 per cent was insecticides, 10 per cent fungicides and 12 per cent pesticides. The balance was accounted for by other miscellaneous chemicals. The company, its representatives said, already possessed a licence for butachlor, a weedicide as also for thiram and carbendazim, both of which are fungicides. The company proposes to produce insecticides also. It contended that the proposed expansion of the product range would give it good returns.

MRL EFFECTS OPTIMISATION PROCESSES

"On-line optimisation of the refinin processes", is being effected at th Madras Refineries Ltd. (MRL) throug technology transfer from Setpoint of th US. Testing of the optimisation techniques was completed on April 12. Givin this information during the course of lecture at the Indian Institute of Technology, Madras, the MRL Chairma and Managing Director, Mr. V.R Deenadayalu, said evaluation of th efficacy of the optimisation technique in the specific context of MRL's ow processes is now under way. He did no wish to elaborate further at this stage

Delivering the Prof. E.G. Ramachandran endowment lecture, on "perspective plan for industry-institut interaction in our country", Mr. Deenadayalu emphasised the need for indigenous research in industry. In the Indian oil sector, accounting for ove Rs. 20,000-crore annual turnover hardly 0.01% of such a sum is being spent on research, he added. Calling on the institutes of higher scientific and technological learning to prepare "technology status papers on various industries", he also suggested the introduction of special grants for joint R & D programmes at the university-industry level.

As for the "technology status papers", the MRL Chairman said these could lay bare the current level of technology in our country (in various industries), the technologies available abroad, their relevance to our country and specific recommendations for adoption of technologies. Mr. Deenadayalu further suggested that each industry could create a technology fund through contributions of small percentage of each company's turnover or profits. This fund could be used to finance practically relevant research, besides the higher education of those already employed in the industry concerned.

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Who's poisoning America

This title (Eds: Ralph Nader, Ronald Brownstein & John Richard, 369p, Sierra Club Books, San Francisco, 1981, $12.95) has the explanatory subtitle: Corporate polluters and their victims in the chemical age. Described here are seven case studies of chemical pollution, focusing on the victims and emphasising the staggering cost in public health, human lives, and the threat of permanently blighted environments. In each case, the pollution is traced back to its source and to the concerned corporations who are indifferent, ignorant and even outrightly defiant of their action and consequences. The conclusion: We are not helpless, IF we band together NOW for our own sake and that of the environment. There are nine chapters by eight writers from the affected communities, ending with a concluding chapter by Ralph Nader. The chapter headings are: The toxic tragedy 1; PBB (polybrominated biphenyl) 60; kepone (a DDT like compound) 85; West Valley (nuclear reprocessing plant) 128; PCB's in the Hudson River 170; An un-reserved judgment (Lake Superior) 206; The politics of poison 240; Love Canal 268; Conclusion: We are not helpless 311. At the end there is a 7p subject index. In each of the poisoning stories, there is the deeply moving human angle combined with a penetrating analysis of corporate and political accountability. The life-and-death issue now seems approaching epidemic proportion and affecting one and all. In the preface, the editors observe:

> It is a massive flood of quiet, cumulative, often invisible violence, too charitably called pollution. Although it usually avoids immediate pain, it silently generates future devastation.

Ralph Nader, the noted citizen's advocate, first shot to fame with the shocking story in UNSAFE AT ANY SPEED. Brownstein and Richard are his associates at the Public Interest Research Group. The magnitude of the problem can b gauged by the fact that chemical waste dumps now numbe tens of thousands, apart from illegal dumping of waste int sewers, ravines, parking lots and abandoned warehouses Contamination of drinking water has become widespread, an residues of chemical pesticides pervade various foods. Meanwhile, an increasing number of chemical compounds are entering the environment and greater danger lies ahead. Thi book seeks to tell: How to stop this widespread poisoning

Thanks to mounting public concern, legislative action ha helped stop production of PCB, PBB and kepone and suspended most of the uses of 2,4,5-T. If the companies concerned had acted responsibly the economic burden woul have been much less; human casualties as also profoun community and family disruptions could have been avoided Companies lack of will to act rather than the lack of knowledge has led to the present sorry state of affairs. Case histories describe the resultant calamities, and lessons are drawn to help prevent future tragedies and lessen the hazards of toxic dumping. The last concluding chapter is the call to action on basis of the lessons learnt. Alternatives are available in both personal and political spheres to prevent pollution o our air, land, water and food. Their implementation could b voluntary or enforced by law. We need to balance environmental needs with energy needs, inflation and other nationa priorities. Among the alternatives is the use of IPM (Integrated Pest Management), which help reduce greatly pesticide use as also cost of growing crops. Companies need t rephrase the cost-benefit analysis to: Are the benefits of new product or technology greater than what it will cost th society? An excellent book, little overdone, but helps driv home the message. Highly recommended.

SMCRI GET-TOGETHER

Need for quality salt stressed

The Central Salt & Marine Chemi- als Research Institute, Bhavnagar, rganised a Get-together of Salt Indus- ry & Scientists, CSMCRI, Bhavnagar '89, on 2nd and 3rd March 1989. It was followed by a Training Programme for Technical Representatives of Salt Industry on 'Quality Control of Salt, Iodized Salt & Recovery of Useful Marine Chemicals', from 6th to 10th March 1989. About 160 delegates participated in the Get-together and 35 trainees from various parts of the country availed the opportunity of the training programme. Dr. P.K. Das, IAS, Managing Director of M/s. Gujarat Alkalies & Chemicals Ltd., Baroda, in his inaugural address made reference to the growth of Chlor-Alkali Industry in the country and correlated the same with the better prospects of the salt industry. He stressed upon the need of good quality salt required by modern technologies to be incorporated in the new capacities of chlor-alkali plants to be installed.

Prof. M.M. Taqui Khan, Director, Central Salt & Marine Chemicals Research Institute, Bhavnagar, in his presidential address made appreciative reference to the achievements of the CSMCRI, Bhavnagar in general and Salt & Marine Chemicals Discipline in particular, especially with respect to the improvement of quality of salt.

The proceedings of the Get-together were divided in five Technical Sessions. The Technical Session-I chaired by Shri S.K. Vakil, was devoted to '**Membrane Cell Technology in Chlor-Alkali Industries**'. Dr. P.K. Das, GACL, Baroda, in his lecture gave broad outlines of membrane cell technology and its socio-economic advantages. Installation of a plant on this technology is in progress at GACL, Baroda. The lecture by Shri C.H. Krishnamurthi Rao, Chairman, M/s. Chemfab Alkalies Ltd., Kalapet, Pondicherry, was presented on the operational experiences of membrane cell plant. It was brought out that the salt produced in India is quite suitable for the use in membrane cells in the form of purified brine.

The Technical Session-II was devoted to '**Iodized Salt**'. Dr. (Mrs.) Vikas Desai, Associate Professor, Preventive Medicine, Govt. Medical College, Surat, delivered a lecture on "Iodine Deficiency Disorders (I.D.D) & Effective Implementation of National Goitre Control Programme (N.G.C.P.). Two other lectures on "Problems in Iodized Salt Manufacture" were delivered by Shri Sumatibhai Kamdar, a Salt Industrialist and Shri R.R. Sheth, President, Central-South Gujarat Salt Manufacturers' Association, Bharuch. Both the speakers detailed out the technical problems in manufacture of iodized salt and administrative difficulties in marketing the same. This decision was chaired by Mr. A.G.T. Carter, Zone Representative, UNICEF, Bombay, who gave an interesting lecture on "UNICEF and Salt Iodization". Shri R. Mohan, Dy. Salt Commissioner, Salt Department Bombay, gave good information on pros and cons of using KIO_3 as iodating agent.

In the Technical Session-III, Dr. J.R. Sanghavi, Shri R.N. Vohra, Dr. S.D. Gomkale, Shri K.M. Majeethia and Dr. H.N. Shah, Scientists of this Institute, gave lectures on "Recovery of Different Byproducts And Upgradation of Quality of Salt".

Shri E.K. Sarma, Dy. Salt Commissioner, Salt Dept., Jaipur, chaired the Technical Sessions-IV & V, on '**The Problems of Salt Industry**'. Dr. J.R. Sanghavi, Scientist, gave detailed account of work and answered queries of salt industrialists regarding quality improvement of salt. Shri K.M. Majeethia, Scientist, answered most of the questions related to mechanical washing of salt and iodization of salt.

The Concluding Session was chaired by Dr. E.R.R. Iyengar, Scientist-in-charge, Central Salt & Marine Chemicals Research Institute, Bhavnagar.

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Raunaq group ties up with Spie-Capag for pipelines

The French multinational, Spie-Capag, has tied up with the Raunaq group for turnkey construction of cross-country pipelines. With this, the Raunaq group will be venturing into the oil and gas sector for the first time. According to the Chairman of the newly-formed company, Spie-Capag India Ltd. (SCIL), Mr. Onkar Singh Kanwar, approval for the collaboration has been received from the Indian Govt.

For the Raunaq group of industries, the venture is a major step in advancing its operations from industrial pipeline projects to cross-country pipeline systems and an initial foray in the oil and gas sector, according to Mr.Kanwar. Spie-Capag and the Raunaq group will each contribute 40% of the equity in the joint venture. Apollo Tyres Ltd., the largest company in the Raunaq group, will contribute to the equity. The remaining 20% of the equity is to come from the Bombay-based, Arya Offshore, which is engaged in logistic and support services in the oilfield sector.

The initial capital of the company has been fixed at Rs. 2 crores. To start with, the new company will concentrate on bagging subcontracting work for the Kandla-Bhatinda product pipeline in high-technology areas. Bids for this project are likely to be invited in the next two to three months. The Raunaq group's entry into cross-country pipeline construction is to be viewed against the backdrop of plans for construction of over 10,000 km of medium and large diameter pipelines similar to the HBJ pipeline project in the next decade. With Spie-Capag's role as a consortium leader in the Rs. 1,700-crore HBJ project, SCIL, hopes to play a major role in similar contracts in the future as well. It may be recalled that the HBJ contract has been completed in a record time by the French-Japanese consortium, with Spie-Capag as the consortium leader. Taking up of similar projects in the future is seen as a major initiative at foreign exchange conservation by the company.

Once its base is established in the country, SCIL would like to venture into turnkey project services in the overseas markets as well. Bangladesh, Malaysia and West Asia are the potential markets. Spie-Capag, which is part of the Spie Batignolles Group of France, has diversified interests in pipeline construction, refineries, petrochemicals and specialised civil construction work. Its annual turnover is estimated at US $3 billion. The Raunaq group is also one of the major conglomerates in India with diversified interests in tyre manufacture, automotive components man facture, steel tubes production a financing. Its annual turnover is e mated at Rs. 400 crores. The gro recently bought the British giant Book Nutritional Products Ltd. to start a ne venture in the country, British Heal Products. The group has been seekin to diversify.

I.I. CHEM. E. SEMINAR ON RECENT TRENDS IN CHEMICA ENGINEERING PRACTICES

The Indian Institute of Chemica Engineers, Bombay Regional Centre, i organising a one day seminar o ''Recent Trends in Chemical Engine ering Practices'' at Taj Mahals' Hote Bombay on 28th April 1989. Dr. S Ganguly of ACC is inaugurating th seminar and will also deliver the keynote address. Eminent persons from various disciplines of chemical engineering will present technical papers. There will also be a panel discussion. Amongst the topics that are likely to be covered are: 1. Safe routes for fine chemicals; 2. Energy efficient methanol process; 3. Integrated oxalic acid process; 4. Membrane process for chlor-alkali; 5. Artificial intelligence in nuclear industry; 6. Recovery of water from effluents through hollow fibre membrane etc.

Further particulars can be had from Dr. G.D. Yadav, Secretary, I.I.Chem.E., Bombay Regional Centre, C/o. UDCT, Matunga, Bombay-400 019.

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SYNTHETIC RUBBER UNIT

Reliance move causes concern

The reported move by Reliance Industries to set up a synthetic rubber unit has caused a flutter in the rubber sector. The Rubber Board is understood to have already brought this to the notice of the Planning Commission.

The proposed 80,000 tonne capacity unit, if cleared by the Government, could have a disastrous effect on the rubber sector. The trade as well as the growers would be badly affect. Already the rubber growers have been clamouring for higher price for their produce. The proposed unit would aggravate the situation, it is pointed out.

However, neither the Rubber Board nor the growers' forums have so far come out openly against the Reliance move. But this is no indication that they would keep quiet. The issue is being discussed in these circles now and they are planning the course of action. What worries them is the tremendous clout wielded by the Reliance group in Delhi.

The project proposal has already been submitted to the Government according to information reaching Trivandrum. There is every possibility of the project being cleared. Reliance Industries is reported to have informed the Government that it intends to export the synthetic rubber produced by the proposed unit. At present synthetic rubber is being produced in the country only by small units. Its total production is estimated to be only around one-fourth of the total production of natural rubber. Now Reliance Industries proposes to raise the proportion to 60:40. This could be damaging to the natural rubber sector.

IPCL, PIL HIKE PLASTIC INPUT PRICES

Indian Petrochemicals Corporation Ltd. (IPCL) and Polyolefins India Ltd. (PIL) have increased the prices of their plastic raw materials -- low density polyethylene, polyvinyl chloride, polypropylene and high density polyethylene by Rs. 1,000 to Rs. 1,500 per tonne. Industry sources ascribe the price hike to increased raw material and utility costs. A price rise was in the air ever since the Government hiked the concessional duty on naphtha used by petrochemical units, in the last budget.

FINOLEX GETS LI FOR PVC

The Finolex group comprising Finolex Cables Ltd., Kirti Electricals Ltd. and Finolex Pipes Ltd., has secured a letter of intent for setting up a Rs. 250-crore project for manufacture of PVC resins near Ratnagiri in Maharashtra, according to Mr. P.P Chhabria, chairman of the group.

.The raw material for making PVC resins, ethylene would be obtained from any of the upcoming gas crackers preferably in Maharashtra. The project which would be a backward integration for Finolex Pipes, would produce at full capacity one lakh tonnes per annum of PVC resins. Out of this, the Finolex group would require 35,000 tonnes for captive consumption, Mr. Chhabria told newsmen at Pune on April 9.

PVC resin was an important raw material for the plastics industry and for the manufacture of various products like pipes, cables, films, profiles, etc. and was now being imported in large quantities to bridge the gap between demand and supply. The project was expected to go on stream in 1992. However, in the meanwhile Finolex Pipes was entering the market with a simultaneous issue of 17,50,000 equity shares of Rs. 10 each for cash at par aggregating Rs. 175 lakhs and 3,50,000 14 per cent secured redeemable convertible debentures of Rs. 300 each for cash at par aggregating Rs. 1,050 lakhs. The shares and debentures would be listed at the Pune and Bombay stock exchanges.

Finolex Pipes had a track record
consistent growth and potentiali
During the period 1984-85 to 1987-
its turnover increased by 168% fr
Rs. 23.55 crores to Rs. 72.66 crores a
profit after tax by 445% from Rs.
lakhs to Rs. 226 lakhs. Mr. Chhab
said the strength of Finolex Pip
derived from its continuous develo
ment activities aimed at automisation
the manufacturing process and introdu
ing the latest product technology.
pioneered the direct dry blend proce
sing of PVC pipes resulting
improvement of productivity makin
PVC pipes more affordable.

The company's other achievemen
included development of 'selfit' pip
where one end of the pipe was sel
socketed to accomodate the plain end
the next pipe. Its 'Ringlite' pipes inco
porated a unique rubber ring sealin
system which allowed expansion
contraction of pipes due to temperatur
variations. The 'Protector' PVC casing
and screen pipes offered an economi
cal, corrosion free, yet strong and dur
able alternative to conventional stee
pipes and finally its 'double wall cor
rupted' pipes offered higher strength t
weight ratio in large diameter pipes.

U.K. INDUSTRY-UNIVERSITY WORK ON ENZYMES

Ten British companies and three universities are to join forces in setting up a new Inter-University Biotransformation Centre to research the use of enzymes in industrial chemistry -- one of the most promising fields of biotechnology. Work is already underway in the U.K. to find new enzymes which may ultimately produce products such as pharmaceuticals and plastics. The key is to find the right enzyme to do the job on the scale which industry, rather than the organism, requires. Biologists can then draw on genetic engineering and a better understanding of the enzymes themselves. Enzymes are also important in the manufacture of food ingredients and cosmetics.

GNFC acetic acid project runs into difficulties

Gujarat Narmada Valley Fertiliser
mpany Ltd.'s (GNFC) attempt to use
Prime Minister's good offices to
edite the clearance for its controver-
l acetic acid project has come to
ught.

GNFC's application seeking approval
release of foreign exchange to pay
foreign collaborator has been stuck
th the Finance Ministry for many
onths.

It is reliably learnt that the relevant
e was handed over to Mr. Rajiv
ndhi by the Gujarat Chief Minister,
r. Amarsinh Choudhary. Mr. Gandhi
ferred it back to the Finance Minis-
, the appropriate authority to grant
proval. The Ministry referred it to the
anning Commission to elicit its opin-
n on the controversial project. The
anning Department is, incidentally,
aded by Mr. Madhavsinh Solanki,
other stalwart from Gujarat.

The Planning Commission is under-
od to have made adverse comments
the project as the existing alcohol-
sed acetic industry has over Rs. 300
ores investment and employs about
e lakh workers. Secondly, new licen-
s have been issued to convert surplus
cohol into acetic acid, which should
e care of the growing demand of this
emical. Thirdly, the Government is
verting potable alcohol to non-
olasses sectors, which may aggravate
e glut situation faced by the alcohol
dustry.

Meanwhile, BP Chemicals of the
K, GNFC's prospective technology
pplier, has sent feelers to an Indian
anufacturer of purified terephthalic
id on whether it would be interested
setting up a captive methanol-based
etic acid plant for its proposed
port-oriented project. The company's
action to the proposal is not known.
e alcohol-based acetic acid industry
proposes to approach the Government for cash assistance to export the material. The industry claims a monthly output of about 9,000 tonnes but says that the offtake is a few thousand tonnes less. When the Government encourages alcohol export with a 10-per cent cash support, it is only logical that a value-added product should also get incentives, it is argued.

India is the only country where acetic acid is produced through renewable agro-based resources like molasses alcohol. Elsewhere, it is produced from methanol, a petrochemical. GNFC's attempt to introduce the petro-route in India, on grounds of high technology, has been opposed by Indian industry from the beginning. GNFC is now lobbying again to expedite its proposal on the ground that its collaborator has offered to buy back 50 per cent of its output. "Export", the password to expedite proposals in today's situation, may still see through the GNFC proposal.

In another interesting development, the All-India Distillers' Association (AIDA) which was given the mandate to export alcohol, has hastily set up a company after learning that as an association, it is not entitled to the 10-per cent cash assistance. Some 700 lakh litres, which have already been exported, will not be entitled to cash assistance because of the lapse on AIDA's part.

RAMAGUNDAM 2ND UNIT SYNCHRONISED

The second unit of the Ramagundam super thermal plant of National Thermal Power Corporation was formally synchronised on April 8, by the Union Minister of State for Power, Mr. Kalp Nath Rai. With this synchronisation, which has been achieved four months in advance, the station has achieved a generation capacity of 1,600 mw.

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JK's citric acid proposal turned down

Two major proposals of JK Singhanias involving a total investment of Rs. 131 crores have been turned down by the government. One of the projects (investment Rs. 26 crores) was for the manufacture of citric acid in the state of Uttar Pradesh for a capacity of 5,000 tpa. The reason for rejecting this project according to government, was that enough capacity had already been created.

In addition, the government felt that the foreign collaborator's technology was not a proven one and that the payment terms entailing foreign exchange outflow was on the higher side.

The project cost of Rs. 26 crores was to have been met thus: internal accruals Rs. 5.20 crores; foreign exchange loan Rs. 2 crores and debentures/banks/rupee from FIs Rs. 18.80 crores.

The second proposal mooted by the JK Synthetics Limited was for the expansion of manufacture of nylon industrial yarn/tyre cord from 2,000 tpa to 12,000 tpa at Jhalawar Patan in Rajasthan at a cost of Rs. 105.00 crores.

The capacity expansion was sought on the lines of the minimum economic scale (MES) scheme on a split location basis, which was not agreeable to the government. When the company originally got clearance for 2,000 tpa capacity at Jhalawar Patan by changing location from Kota, it was specifically told at that time (in 1987) that "in the event of MES scale of operation being prescribed for this line of manufacture it would not be automatically entitled to it at Jhalawar".

In the view of this the govt. turned down the proposal. The sources of project cost of the Rs. 105 crore expansion were: internal accruals Rs. 25 crores, debentures Rs. 50 crores, foreign exchange loans Rs. 25 crores and deferred payments/suppliers credit Rs. 5 crores.

BARODA HEAVY WATER PLAN
RESTARTS

The Baroda heavy water plant, whi
had to be shut down following a fire
the fertiliser plant of the Gujarat Sta
Fertiliser Corporation, has sinc
resumed operation and the plant is fun
tioning normally, according to a spoke
man for the Department of Atom
Energy.

Meanwhile, the unit I of Madra
Atomic Power Station which resume
operation on March 24, after attendin
to the heavy water leak, was shut dow
again on April 4.

The leak occurred again and th
authorities are investigating if the lea
occurred in the old spot or a fresh lea
has sprung. The second unit of (MAPS
is also currently shut down. It may tak
three months for the unit to come o
line.

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GACL to try new surfactant

Gujarat Alkalies and Chemicals Ltd., GACL) has decided to test market a ew detergent raw material called econdary alkane sulphonate (SAS-4).

GACL,which holds a letter of intent o set up a 24,000 tpa unit to manufacure this surfactant, will soon begin a market seeding programme with imported material, the GACL Managing Director, Dr. P.K. Das, said.

SAS is produced by sulphoxidation of N-paraffins (C 12 - C 20 but preferably C 14 - C 18 range) followed by neutralisation with sodium hydroxide. It is costlier than linear alkyl benzene sulphonate (LAS), the most widely used surfactant all over the world, including India.

SAS is said to be similar to alpha olefin sulphonate (AOS) which has recently been introduced in India. The plus points of SAS include good water solubility, wetting power and better biodegradability compared to LAS.

AOS has recently made inroads into the toilet soap, shampoo and liquid detergent market thanks to its superb foaming quality and the skin comfort it offers. Two local units are manufacturing AOS from imported alpha olefins. However, no detergent produced is known to be using SAS at present. The method of using it with other materials to produce its acclaimed "synergistic effect" and the products efficacy will have to be proved and popularised before it can carve out a market, according to industry sources at Bombay.

The global consumption of LAS is equal to that of all other surfactants put together. SAS consumption is estimated to be less than one lakh tonnes a year. Dr. Das is confident that SAS will be well-received by the market. GACL's research and development department has formulated detergent powder as well as cake using SAS. The material also has other applications -- as an emulsifier, in automotive tyres and textile auxiliaries, for example.

If the product clicks, GACL intends to set up a unit for indigenous manufacture, Dr. Das said. The company has entered into an informal understanding with Hoechst of West Germany for supply of technology.

HINDUSTAN LEVER HOPEFUL OF LAB PROJECT

Hindustan Lever has not given up its ardent hope for setting up a linear alkyl benzene (LAB) project, despite the delay of four years in approving the project by the govt. The company has recently attended the meeting called by MRTP in connection with the LAB project. The management is expecting an early clearance by the government.

According to Dr. A.S. Ganguly, Chairman, the company has an open mind in selecting the location for the project. Although it has preferred Vizag in Andhra Pradesh, it is not averse to putting up the plant elsewhere such as Haryana or Punjab. Replying to newsmen's enquiries on the LAB project, Dr. Ganguly said that the project with a capacity of 60,000 tonnes per annum would now cost Rs. 142-150 crores.

The Chairman said that the project would give a competitive advantage to the company in the production of detergents. After meeting its needs, it can sell the balance to other users. Dr. Ganguly also scotched the rumours that the company might close down its Sewri (Bombay) unit in view of the prolonged labour problem. Giving the background of the labour problem at Sewri, where the first ever lockout is currently in force, he said that the key issues in the case were the union's demand for higher wages and the management's concern over rampant indiscipline and declining labour productivity. The lockout was declared on June 21, 1988.

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CONTROVERSY OVER MADRAS PETROCHEM EOU SETTLED

Linde AG confirms interest

The controversy over the denial by Linde AG about its participation in the proposed Rs. 840-crore petrochem export-oriented project at Madras, has at last been settled. The West German firm has written to the Indian government confirming its continuing interest in the project in association with the R.P. Goenka Group.

It is learnt that Linde's letter was received by the Indian government recently. This was in response to a telex by the authorities at New Delhi seeking confirmation over the West German firm's intentions in going ahead with the proposed EOU project at Madras.

The West German firm has indicated that there is no question of its backing down from the earlier position. In fact, it goes on to say that the letter of intent issued for the project by the Indian government is currently being studied by the company's officials. It is also taking action to tie-up the required parties for its export project including the market for its end product aand allied details relating to finance. Details of the partnership with the Indian party are also being tied up.

Experts in the petrochemical field feel that once the details are available, then the government too might decide to modify some of the conditions imposed on the LOI issued to the West German company.

The letter from Linde AG has put at rest all doubts and apprehensions in regard to the EOU project. As one source said, "It is a positive response setting at rest all speculation". The controversy had erupted following the publication of a denial by the West German company regarding its participation in the Rs. 840-crore EOU project. The denial was published in the February issue of an American trade journal on petrochemicals.

The West German company, which was responding to a news item about its participation in the Madras project, in the journal, had said: "this company does not aim to build an ethylene plant in Madras in a joint venture. Linde AG does not intend to extensively finance the ethylene project in Madras and take over capital shares of the operating company. Linde will not participate in the marketing of products and the import of feed materials for the ethylene plant at Madras".

While Linde's letter to the Indian government now sets the doubts at rest, it still does not explain the provocation for its denial in the American trade journals. That is a matter which is puzzling everyone. Incidentally, it is learnt, that the initial proposal of the West German company for the Madras project was quite sketchy. It did not indicate anything other than its interest in the project. There was no mention of the parties to whom the end product would be shipped.

Then there were doubts about the conditions stipulated in the LOI which did not allow any sale in the domestic market. The LOI further lays down that Linde AG-RPG Enterprise cannot have access to Indian commercial banks or state-owned financial institutions, for financing the project in anyway, including contribution to equity.

Another condition is that the export of ethylene, propylene, butadiene, benzene and gasoline, from the project, should only be to the hard currency areas. Yet another condition is that the minimum value addition should be 24.6 per cent, against the normal 20 per cent. Now it is expected that having confirmed its intention to go ahead with the proposed project, the West German concern will come up with a detailed proposal giving all the required information.

Relaxation of terms sought

The Linde AG-RPG enterprises jo
venture has sought relaxation of so
of the severe conditions imposed by
government in its letter of intent for s
ting up the 100 per cent export orien
petrochemicals project at Madras.

Mr. R.P. Goenka, chairman of
RPG Enterprises, the Indian partn
reacting sharply to the unprecedent
and impractical terms for setting up
project, is understood to have request
the government for permission to s
rejects up to five per cent of the val
of the output in domestic tariff, exp
to Soviet Union and Comecon countri
and also the right to sell to Indian co
sumers as "deemed exports" besid
access to the Indian capital market f
funding the project.

The joint venture has also sought
option to sell 25 per cent of the capa
ity in the domestic market with a vie
to "providing comfort to bankers fun
ing the project".

Since the approval of the project
few weeks ago, uncertainty continues
haunt its implementation because of th
unusually restrictive conditions la
down by the government in the letter
intent. In fact, the very viability of th
Rs. 840-crore petrochemicals project
threatened if the controversial cond
tions are not relaxed.

Moreover, the whole project, whic
is as innovative as it is path-breaking fo
the Indian industrial sector, has bee
conceived as per the declared policie
governing EOUs. The imposition o
special stiff conditions, corporat
observers say, may not lead to fructifi
cation of the project.

The Linde-RPG project involves a 5
per cent holding for the two promoters
namely, Linde of West Germany an
the RPG Enterprises of India. The ven
ture was envisaged on the premise tha
if the conditions applicable were thos
as were commonly applicable for 10

er cent EOUs, then the project ecomes easily bankable in the world inancial market. The bankability of the roject is crucial for the success of such ventures, it is stated.

RPG Enterprises has said that the modification of some of the conditions would go a long way in the speedy implementation of the project besides helping in negotiations with foreign banks for the "bankability" of the project.

The letter of intent issued on March 16 stipulates the condition that the promoters should tie up specific export markets to the satisfaction of the Indian government. However, since a major part of the finance for the project is going to be raised in international markets, the consortium of banks arranging the finance would look very closely at the markets where the products are to be sold.

The primary need for the promoters would be to satisfy the banks, and if they are satisfied and prepared to fund the project, the marketing assessment should be acceptable to the Government of India. The clarification on this count is sought to avoid a situation where there could be a conflict in the views accepted by the international banking community funding the project and the Indian government.

The Indian partner has also assumed that the Reserve Bank of India would give it the freedom to travel abroad as well as to engage services of foreign technicians and experts without any restrictions for initial work and planning of the project. Also, an assurance is sought on the repatriation of the dividends as per the declared policy of the Indian government for 100 per cent export-oriented units.

In a communication to the board of approvals of 100 per cent export oriented undertakings, New Delhi, the Indian partner has said that sale of rejects upto five per cent of the value of the output in the domestic market should be permitted in view of the fact that some of the products that are either residues and by-products are not normally traded international commodities and not practical for exports. The project had clearly envisaged that the promoters would be able to accomplish this on the basis of well accepted and known norms of 100% export oriented units.

Secondly, although the promoters have accepted the condition that the products should be exported to hard currency areas, it is felt that the condition imposed precludes the project from exporting to countries such as Comecon and the USSR which otherwise are well established and accepted routes for export of Indian products and are given no differential treatment. The Indian government permits Indian producers to import certain feedstocks under the actual users' licence. The Linde-RPG venture should not be denied the opportunity to sell these commodities as long as prices are competitive and deliveries are acceptable, it is argued. In other words, the channel of the "deemed exports concept" should be available to the proposed venture. Further, though the promoters have agreed that no term loans should be obtained from Indian financial institutions and nationalised banks, the promoters should have free access to the Indian capital market and to tap facilities other than term loans that are normally available to 100 per cent EOUs.

NEW BLOOD SUBSTITUTE

An entirely new blood substitute, which can be given to all patients regardless of blood type, will be introduced in the world market soon. An agreement for its production was recently signed between Northfield Laboratories of Chicago, USA, the developer of the product and the Swedish pharmaceutical firm, Kabi. The new blood substitute is based on polymerised human haemoglobin recovered from donor red blood cells.

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FACT plans to enter petrochemicals

Fertilisers and Chemicals Travancore (FACT) proposes to diversify into the petro-chemical sector in a big way.

The company Chairman and Managing Director, Mr. N.B. Chandran, told a press conference at Cochin on April 7 that in view of the number of fertiliser units coming up in the country, the area of operation for FACT products was getting reduced. With oil prospects bright in the Cochin offshore it would be ideal for the company to diversify into the petrochemical sector.

He said that a meeting of experts in the industry will be held at Cochin soon to discuss the subject.

Mr. Chandran said production and marketing of fertilisers during 1988-89 was an all-time high. Production of products, such as ammonium sulphate, urea and complex fertilisers, was a record 1.052 million tonnes and the sales volume a record 1.156 million tonnes with a turnover of Rs. 394 crores including subsidy.

Rs. 28.4-cr. profit

Mr. Chandran said the profits before tax during 1988-89 was Rs. 28.4 crores, an increase of Rs. 12.4 crores over the previous year. He said that the Union Government's subsidy scheme was in no way responsible for the profits made by fertiliser units in the country, particularly FACT.

On the other hand, the recent change in the norms that determine the subsidy has affected the profitability of a few fertiliser units including FACT, Mr. Chandran who is also the Vice-President of the Fertiliser Association of India, said. Consequent to the latest change, FACT's profit in 1988-89 has been reduced by Rs. 11 crores, he said. But for the change it would have been Rs. 39 crores, he claimed.

He said that if profits were due to [illegible] FACT should have been making profits since 1977 when the scheme was introduced. But only since 1983-84 the company started making profits. Other fertiliser units like FCI and HFC continue to be in the red despite the subsidy, he added. The improved performance, Mr. Chandran said, is the result of operational efficiency, better management and team work. These are the reasons why even the 40 year old unit of FACT, the Udyogamandal division which had been written off by the entire fertiliser industry, could make a profit of Rs. 8.4 crores in 1988-89, he said.

The FACT Engineering Works (FEW) had bagged an order worth Rs. 10.6 crores from the Bangalore Water Supply and Sewerage Board. Schemes were on hand for expansion and diversification of large diameter pipes for application in the oil sector, he said. The chairman said the company proposes to implement projects costing Rs. 974 crores during the Eighth Plan. The projects include replacement of the old ammonia plant at Udyogamandal, NPK plant expansion of Cochin division phase II, revamping urea plant, energy conservation, diversification into aniline and down-stream products, formaldehyde complex, titanium dioxide and ethylene downstream projects and bisphenol and polycarbonate complex.

MATERIALS CRISIS LOOMS AHEAD: NCL DIRECTOR

Dr. R.A. Mashelkar, acting director of National Chemical Laboratory (NCL) warned that a serious crisis of materials was looming large before the country and urged that scientists and industrialists should take steps now before they are overcome by it.

Dr. Mashelkar who was delivering the key-note address on "opportunities in polymer technology" at the inauguration of the four-day "PLASTO '89" exhibition, organised by the Poona Plastics Manufacturers Association (PPMA and Maharashtra Industrial and Technical Consultancy Organisation Ltd (MITCON) on April 5, said that Indi may even have to import wood as larg scale construction of houses are using up forests for the wood. Stating that this was at once a challenge and an opportunity to the polymer industry Dr. Mashelkar pointed out that India would be producing 20 million tonnes of urea which will have to be packed before marketing.

"This alone will require developing and producing a plastic packing material in huge quantities", he said. Dr. Mashelkar did not foresee any problem of raw material availability as India was planning huge gas cracker plants. Dr. Mashelkar referred in this context to the difficulty in acquiring certain types of technology "for love or money" and cited the instance of know-how for producing polycarbonate.

He revealed in this context that NCL and India Petrochemicals Corporation Ltd. (IPCL) were engaged jointly in producing this material which was at an advanced stage of development. He feared that at least half of the 20 million tonnes of urea produced in the country would be wasted if no know-how is developed for preserving the urea leached from the soil. He also referred to the production of commercial alloys for which technical know-how had to be developed indigenously. The modern industry used such alloys in large quantities and they therefore held the key to their future growth.

Dr. Mashelkar was confident that plastic industry had great future in the country because of the size of the domestic market, and sharp entrepreneurial skill available in India. Mr. H.K. Firodia, president of the Maharashtra Chamber of Commerce and Industries (MCCI) and chairman of Bajaj Tempo Ltd. inaugurating the exhibition said plastics industry was an exception to the popular saying in industry that 'small was beautiful'.

Pune hosts 'Plasto '89'

Holding a exclusive national exhibiion on plastics industry in Pune, which seemed to be a "fantasy" a year ago has turned into a reality with the "Plasto '89" exhibition being inaugurated at the College of Engineering grounds in Pune on April 9.

Organised by the Poona Plastics Manufacturers' Association (PPMA) in coordination with the Maharashtra Industrial and Technical Consultancy Organisation (MITCON) with a year's planning, about 100 small and big units from different parts of the country (large number being from Bombay-Pune industrial belt) have come up to make people aware of tremendous technological developments taking place in the field.

Rapid advancements having taken place in the plastics industry during the past two decades, "Plasto '89" has been opened with an aim to bring together the developments in raw materials, machinery, processing and auxillary equipments, according to PPMA advisory council chairman, Mr. Arvind Kirloskar.

Of the 100 participants in the exhibition, 40 per cent are from the small sector industries while 60 per cent are from the organised sector which include 80 per cent of national and international character, Mr. Kirloskar said.

The state-owned Indian Petrochemicals Corporation Limited (IPCL) and the Gujarat State Fertilizers Company (GSFC) Vadodara, have come with attractive pavilions in the centre of the exhibition displaying their wide range of products.

Two defence units - the Armament Research and Development Establishment (ARDE) and the Khadki Ammunition Depot - of Pune have also displayed their products seeking replacement of steel and wood by plastics from the country's manufacturers.

Plasticulture: IPCL to take up dist. scheme

IPCL will undertake 'plasticulture district programme' (PDP) in 15 districts in the country in the next two months.

The IPCL Deputy Public Relations Manager, Mr. M. Yasin Shaikh, said that the Centre has identified the 15 districts for the programme. The Centre is expected to spend Rs. 50 crores on the programme during the next two years.

Mr. Shaikh said IPCL has established a plasticulture development centre in the Phule Agriculture University, Pune, to encourage the use of plastics in the field of agriculture. Over 2,400 hectares has been brought under the drip irrigation system in Maharashtra. He said IPCL has identified works totalling to over Rs. 40 crores in Nashik district alone. Proposals have been made to bring in 600 hectares of horticulture crops utilising plastic crates for collection and transportation.

According to the IPCL chairman and M.D., Mr. Hasmukh Shah, "drip irrigation" provides a system for better management of the country's water resources. Even if India used its entire available surface and sub-surface water resources estimated to be 110 million hectare metres, hardly 35 to 40 per cent of the cultivatable areas would get irrigated. The situation is even more alarming in semi-arid and arid parts.

Against a population projection of 1,000 million by the year 2000, water could become "a major natural resource constraint" limiting economic development, he adds. Besides, the traditional system of flooding the land causes a loss of 70 per cent of precious water resources by evaporation and seepage. Applying only the required quantity of water and nutrient directly to roots can help.

The IPCL General Manager (Plasticulture) Mr. N. Jagannathan, said that the programme envisaged the intensive use of plastics in polyvinyl chloride (PVC) water network, pond and canal lining, green house, mulching and drip irrigation.

Lining ponds and canals with the plastic films reduce water seepage losses drastically. Similarly, nurturing plants in the controlled agro-climatic conditions of green house increase their yields. In tropical regions green house cultivation over a limited area results in greater productivity.

Mulching refers to the practice of spreading a black polyethylene film over a field to ensure water conservation and elimination of weeds. This film has holes at periodic intervals to enable saplings to shoot up through them, while weeds are speedily eliminated due to the absence of direct sunlight. Water conservation results from reduced evaporation losses, Mr. Jagannathan added.

Earlier in June, 1988, the Planning Commission, several Government Ministries and IPCL officials had briefed the Prime Minister's Secretariat on the scope of plasticulture applications. Subsequently, 15 districts -Nashik (Maharashtra), Panchmahals (Gujarat), Dharwad (Karnataka), Madurai (Tamil Nadu), Sultanpur and Nainital (U.P.), Birbhum and Balasore (W.B), Kalahandi and Koraput (Orissa), Ferozpur (Punjab), Hissar (Haryana), Sikar (Rajasthan), Khammam (A.P.), and Jabalpur (M.P.) - were selected for intensive propagation of plasticulture at grassroots. Detailed surveys of these districts have already been conducted and submitted to the Union Govt. for its consideration, the IPCL officials said. These districts would serve as a nucleus to "further intensive growth of plasticulture application" in surrounding areas, they felt.

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IPCL may bag Auriya gas cracker complex

The State-owned Indian Petrochemicals Corporation Ltd. (IPCL) is likely to pip the Gas Authority of India Ltd. (GAIL) for the contract to set up a gas cracker complex at Auriya in Uttar Pradesh.

The Union Government, it is understood, has, in principle, decided to set up only one mega gas cracker complex during the Eighth Plan period in the public sector. This is based on the conclusions of a high-power panel on the approach to the Eighth Plan that in view of the huge investment of about Rs. 2,000 crores involved, just a single project would be possible during the five-year period.

State governments have been vying with each other for setting up the prestigious cracker complexes in their respective States. Proposals under consideration at present are for projects at Auriya in UP, Vizag in Andhra Pradesh and Mangalore in Karnataka. Auriya, however, may get the final nod in view of the easy availability of natural gas through the HBJ pipeline which passes through the prospective site.

UP has also been very active in campaigning for petrochemical projects -- what with detailed seminars held on the subject -- and the heavyweight in its Chief Minister. A final decision is expected to be taken very shortly.

In case Auriya is selected as the site for the lone gas cracker in the next five years, it is almost certain that the project would go to IPCL. This is because the State Government itself has shown keen interest in handing over charge to the premier petrochemical company.

The reasons for this are many. First, IPCL is presently engaged in setting up the country's first gas-based petrochemical complex at Nagothane in Maharashtra. The gas cracker complex is in its last lap of completion and the project is well within the time schedule. Secondly, over the years, the State unit has built up considerable expertise and manpower in the field and is well-equipped to handle a project of that size.

Third and most important, IPCL, the State Government feels, would have no problems in mopping up the required funds for the project on its own. Similar views are held by the authorities at New Delhi also.

A highly-placed official felt that as IPCL is in the process of completing the Nagothane unit, no time should be lost in awarding the gas cracker to it for implementation during the Eighth Plan.

The UP Government, on its part, has already begun spadework for the project. A high-power team led by the Secretary in the Department of Chemicals and Petrochemicals, Mr. M.S. Gill, along with the IPCL Chairman, Mr. Hasmukh Shah, visited Auriya recently for discussions on the exact location of the project keeping in view the environment and pollution control angles. Talks were also held on the infrastructural problems and the minimum amenities and facilities that would be essential for a project of that size.

With the petrochemical industry in the country set for a big leap, UP is confident of bagging a significant share of these industrial development programmes in the coming years. The confidence stems from the setting up of a large refinery at Mathura, laying of the HBJ pipeline, increased availability of industrial alcohol, improvement in infrastructural facilities and buoyancy in the investment climate.

The State, the Government feels, has reached the take-off stage for rapid development in this sector and it is now for the entrepreneurs and the agencies concerned to rise to the occasion and take advantage of the available opportunities.

In fact, a number of letters of intent/industrial licences for setting up such projects in the State have already been issued and are at various stages of implementation. The projects, cleared in the last two years, involve a cumulative capital investment of about Rs. 1,500 crores.

Some of these projects are for the production of polyester filament yarn, acrylic fibre, polypropylene, phthalic anhydride, cross-linked polyethylene, vinyl pyridine latex besides substantial expansion of capacities for styrene butadiene rubber (SBR), monoethylene glycol (MEG), polyester staple fibre (PSF) and vinyl acetate monomer (VAM).

The list of companies involved in setting up the projects reads like a who's who in the petrochemical field. These include Reliance Industries, Raymond Woollen Mills, Synthetics and Chemicals, Vam Organic Chemicals, India Glycols, India Polyfibres and Ester India besides the State agency, PICUP. The Auriya gas cracker is expected to further catalyse investments in downstream units and throw open avenues for processing units and employment in the State.

ATOMIC ENERGY COMMISSION RECONSTITUTED

The Centre has reconstituted the Atomic Energy Commission retaining Dr. M.R. Srinivasan as the chairman. The names of other members released at Bombay on April 8 are: the Scientific Advisor to the Prime Minister, Prof. M.G.K. Menon, the Principal Secretary to the Prime Minister, Mr. B.G. Deshmukh, the Cabinet Secretary, Mr. T.N. Seshan, the Finance Secretary, Mr. G.K. Arora, the Bhabha Atomic Research Commission Director, Dr. P.K. Iyengar, the Tata Sons Ltd. Chairman, Mr. J.R.D. Tata, the Indian Institute of Science Bangalore, Director, Prof. C.N.R. Rao and Nuclear Power Corporation Managing Director, Mr. S.L. Kati.

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JOINT MARKETING, R & D PROGRAMME

IPCL, INA sign pact

The Indian public sector undertaking, ndian Petrochemicals Corporation Ltd. IPCL) and INA of Yugoslavia have igned an agreement for the joint marketing of each other's products in their espective countries. In addition, the two companies will undertake joint R and D programmes and product development and engineering facilities both in their own markets and third countries. A memorandum to this effect has been signed by INA and IPCL recently.

The agreement will help in boosting trade in petrochemical items between India and Yugoslavia. As per the agreement INA Commerce of Yugoslavia will pick up items produced by the Indian Petrochemicals Corporation Ltd. (IPCL) including Linear Alkyl Benzene (LAB) and acrylates. These will be supplied to the end users in Yugoslavia.

The Indian public sector company will, on its part, import low density polyethylene (LDPE) from INA. The imports could even be based on the ethylene exported by IPCL. According to official sources, IPCL and INA have decided to enter into a long term contract on mutually acceptable terms for a minimum of one year (1989) or up to 1991.

INA also plans to sell VCM and PVC to IPCL for the Indian market in addition to polypropylene. Besides, the two parties have decided to enter into an agreement for joint co-operation, assistance and exchange of research and development, both for mutual benefit and third world countries.

On the Indian side, IPCL and Engineers India Ltd. (EIL) will explore the possibility of offering expertise to INA or other Yugoslav companies in their future programmes for identification, evaluation, designing, engineering and debottlenecking of existing plants.

During their discussions, the two sides noted that the volume of business was rather low, at about 29,000 tonnes in 1987 with an approximate value of Rs. 20 million mostly in LDPE. Though a protocol was signed between INA and IPCL earlier, it was not implemented fully because of a fall in the prices of commodities in the international market in the last few months, sources explain.

The two sides felt that for ensuring a lasting relationship, it was imperative to formulate some long term arrangement for a smooth and consistent flow of trade and business. Possibilities of exchange of scientists were examined. India, it was explained, was in a position to export LAB, PSF and woven sacks. Possibility of conversion, of ethylene to LDPE, by INA, if supplied by IPCL, were also discussed. An Indian delegation, which had visited Yugoslavia recently, noted that the country's research was limited to polymer characterisation with rather old equipment.

The Indians also visited another unit namely, Chromos, a manufacturing and trading corporation. Chromos showed interest in developing sources for its inputs as also customers. The major areas of interest were insecticides, pigments and surfactants. This, it was felt, could provide good business in the areas of solvents, mixed xylenes and acrylates. Meanwhile, IPCL has offered its indigenously developed know-how to Yugoslavia on various grades and types of activated alumina, molecular sieves and catalyst carriers coupled with speciality catalysts. INA, on its part, offered its expertise for the manufacture of liquid polyethylene crystals and various polymer additives and polymer blends. Incidentally, Yugoslavia has also shown interest in importing penicillin from India, in addition to solvents, injectible gentamycin, various veterinary drugs and parasitic drugs and insecticides. India showed interest in importing drug intermediates and rifampicin along with anti-cancer drugs.

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Petrochem perspective plan drawn up

The petrochemical industry would be a thrust area in the Eighth Plan, the Minister of State for Petroleum, Mr. Brahm Dutt has said.

The Government has drawn up a long-term perspective plan for the petrochemical industry in view of the realisation that this sector would contribute in a big way to the national economy.

Addressing the plenary session of the International Institute of Synthetic Rubber Producers (IISRP) at New Delhi on April 10, Mr. Brahm Dutt called upon entrepreneurs and industry members to upgrade and modernise technology.

He urged the foreign participants to explore the possibilities of transfer of their up-to-date technologies and equity participation in the form of joint ventures with their Indian counterparts to ensure that India kept pace with the latest developments.

Mr. Brahm Dutt observed that the availability of natural products is not likely to show any significant increase due to pressure on land for foodgrain production.

Hence, the clothing needs of the population would be a big challenge which may have to be supplemented by synthetic fibres from petrochemicals. More use of petrochemicals in the agricultural field will be necessary to enhance productivity and improve storage and efficiently manage various inputs like water, nutrients and pesticides.

In the case of housing, transportation and communication also, various petrochemical products will often form an essential part of daily existence, he said.

Mr. Brahm Dutt observed that in India, the growth of natural gas production is phenomenal. The Government is making all efforts to develop infrastructure in this area. Optimum utilisation of natural gas has to be ensured, he said.

Mr. Brahm Dutt said products derived from petrochemical sources like plastics, synthetic rubber, and industrial chemicals would supplement various natural products like cotton, wool, wood and metals.

He said the growth of synthetic rubber is linked to its availability and cost. Synthetic rubber cost more in India than natural rubber, which was grown in large quantities.

He hoped the inputs of synthetic rubber would be made available indigenously with the growth of the petrochemical industry and with a higher scale of operation the prices of synthetic rubber would come down.

Mr. Brahm Dutt said a rational approach has to be adopted under which the interest of natural rubber growers should be kept in mind while protecting the synthetic rubber industry.

Mr. H. Shah, Chairman and Managing Director of Indian Petrochemicals Corporation Ltd. (IPCL) observed that the present per capita consumption of rubber in Asian countries is lower than that of advanced countries.

The synthetic rubber industry in India is poised for a big leap forward, he said.

Mr. M.S. Gill, Secretary, Department of Chemicals and Petrochemicals, stressed the need for development and expansion of production of synthetic rubber in Asia.

The IISRP President, Mr. Suresh Kilachand, said synthetic rubber represented about 70% of the total world consumption of rubber but in India it is only about 20%. However, the rate of growth of rubber consumption is much higher in India than the world average.

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TECHNICAL GRADE PESTICIDE SUPPLY

Government to enforce norms strictly

The Department of Chemicals and Petrochemicals is expected to issue a directive shortly to manufacturers of technical grade pesticides asking them to supply 50 per cent of their production to non-associated formulators, it is learnt.

Although the government had issued a set of guidelines in this regard in 1987 to the basic manufacturers of pesticides most of them are not observing the guidelines causing inadequate availability to the formulators.

In some cases the basic manufacturers have been even using their entire production of technical grade material for their own formulation activity. According to informed sources at Bombay, the government's plan to strictly enforce 1987 guidelines now is in the context of recent hike in the import duty on these widely used pesticides namely monocrotophos, butachlor and methyl parathion.

With the hike in customs duty on these pesticides to 105 per cent their imports have become virtually unviable leading to a monopolistic situation and unfair trade practices in the domestic market.

In fact shortly after the government decision to raise the import duty to 105 per cent, basic manufacturers had already jacked up the prices. For instance, the price of monocrotophos technical of 100 per cent purity is revised to Rs. 230 per kg now from 210 per kg by a leading manufacturer.

In a recent meeting with the senior officials of the Department of Chemicals and Petrochemicals, the Pesticides Formulators Association of India has brought these unwarranted price hikes and the unfair trade practices follow by the basic manufacturers to the go ernment's attention. The officials ha thus decided that basic manufacture would have to provide an explanatio for any unwarranted price hikes of tec nical grade materials. The departme will also closely monitor whether bas manufacturers will be supplying 50 p cent of their production to the non associated formulators.

The argument of the basic manufac turers is that non-associated formulator are not dependable for lifting of tech nical material during the off season And, when the season is expected to b good, the formulators with their inflated demand complain of not getting the material.

However, with the restriction on the import and with the expected higher demand for pesticides during this kharif season the country is going to face a shortage for some of the widely used pesticides, the sources say. The shortage may be acute in the case of monocrotophos, a commonly used pesticide for various cash crops. The likely production of this pesticide in the country is only 3,000 tonnes this year as against an estimated demand of 4,000 tonnes.

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WAVE ENERGY PLANT BY JUNE-END

The country's first wave energy plant being set up off Vizhinjam near Trivandrum will be operational by June-end. The Rs. 106 lakh-pilot project was originally planned to be commissioned in April but mishap caused the grounding of the 2100-tonne concrete caisson in a tilting position 15 metres away from its appointed slot.

A private firm, Goa Salvage and Towing Company is now engaged in towing the caisson which has the height of a five storey building and erecting it. It would be positioned shortly, a spokesman of the Ocean Engineering Centre of the project said.

News in Brief

SHAREHOLDERS APPROVE CHANGE OF NAME TO ICI INDIA

IEL Limited, the Indian subsidiary of Imperial Chemical Industries PLC of the UK, will soon be known as ICI India Limited. A decision to this effect was approved by shareholders of the Company through a resolution passed at a General Meeting of shareholders held in Calcutta on 6th April.

This name change resolution now awaits approval by the Central Government before it formally comes into effect.

In 1984, following the amalgamation of erstwhile ICI Group Companies Alkali & Chemical Corporation of India Limited (ACCI), Chemicals & Fibres of India Limited (CAFI) and Crescent Dyes & Chemicals Ltd. with Indian Explosives Ltd., the company was styled 'IEL Limited' in keeping with its diversified, multi-product operations.

However, due to the far stronger association with the ICI name among customers and the general public, it has been found appropriate to change the company name to 'ICI India Limited'.

An agreement, pertaining to this, was signed between IEL Limited and its principal Imperial Chemical Industries, PLC of UK on 23 February 1989.

The name change reiterates a continuation of ICI UK's commitment to participate and grow in India in the field of high technology value added chemicals. With ICI PLC's vast investments in Research & Development, ICI India will have a window to the world class technology and immense resources of its parent company and new products such as 'Tenormin', a world leader in heart drugs, polyurethanes and membrane electrolyser cells will soon have a manufacturing base in India.

BHPV HANDS OVER AMMONIA TOWER TO KRIBHCO

The State-owned Bharat Heavy Plates and Vessels Ltd. (BHPV), recently handed over at a function held at the project site at Hazira a gigantic ammonia exchange tower to Kribhco.

BHPV utilised its unique expertise of multilayer technology to manufacture this gigantic tower weighing 426 tonnes with an inside diameter of 2000 mm and an overall height of 42,200 mm.

BHPV, according to a press release, so far manufactured and supplied more than 30 multilayer reactors, towers, vessels for various applications and their earlier supplies include critical ammonia and reactors for fertiliser plants and other process industries. Speaking on the occasion, Mr. S.M. Sundaram, Chief Executive of Heavy Water Plants, expressed full satisfaction with BHPV gear performance.

Mr. H.S. Kohli, Director (Operations) of Kribhco, appreciated the team work, the site management, the planning process and BHPV's commitment at the top management level which made it possible to deliver the exchange tower in a record time. Mr. T.V.S. Sastry, Managing Director of BHPV, expressed his gratitude to Kribhco for giving an opportunity to BHPV to associate with such nation-building projects. Mr. S.P. Ramamurthy, Senior Manager (Western region), earlier welcomed the guests and proposed a vote of thanks.

MOVE TO STABILISE COPPER PRICES

The Government is considering the formulation of a mechanism to ensure copper price stability in the domestic market and efficiency of production by the primary producer, Hindustan Copper Ltd. (HCL). Addressing a workshop at New Delhi recently, the Mines Secretary, Mr. B.K. Rao, said the sectoral demand profile of copper made it largely elastic in price and so, price instability affected the consumer directly. It was quite evident last year, he said, when periodic quantum jumps were witnessed in international prices. The Government had then to come to the rescue of the consumers with ad hoc fiscal measures.

He said the demand for copper is set for big growth. As it was largely consumed in the capital goods industry, the level of total consumption was directly influenced by the level of industrial activity. He said in the light of the six per cent industrial growth in the gross domestic product (GDP), during the Eighth Plan period, the annual demand for copper is expected to rise by 6.9 per cent and would be 2,00,000 tonnes by the terminal year of the Eighth Plan.

He said indigenous production of the metal is only one-third of the demand and the unfavourable demand-supply gap is likely to continue. The mineral resources are limited and there are various techno-economic constraints. The ongoing modernisation, debottlenecking and expansion of projects of smelter-refinery complexes of HCL are likely to result in an increased capacity of 65,000 tonnes by the end of the Eighth Plan but would not help in improving the demand-supply scenario, he said.

NORMS FOR MINERAL LICENCES SIMPLIFIED

The Govt. has simplified the procedure for issuing licences of minerals like rutile, zircon and ilmenite. The licences will be issued by the Department of Atomic Energy for three years. The applicants, however, have to indicate their half-yearly requirements clearly in their applications. Licences issued on/or after April 1, this year will be valid upto March 31, 1992.

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Import duty on fatty acids modified

The duty structure on fatty acids and cohols was corrected by amending otification number 121 issued on April The basic duty on all fatty acids and dustrial monocarboxylic fatty acids ther than stearic and oleic acid) was ised to 200% from 125%. Basic duty n stearic acid (stearin) and oleic acid ontinues at 125%. Last, basic duty on cid oils from refining and industrial tty alcohols was lowered to 60% from 25%. Auxiliary duty at 45% and full xemption of additional duties continue.

The amendment restores the pre-udget position on the items. The highst duty rate of 200 per cent is appliable on fatty acids. Fixed vegetable oils xcept rapeseed oil and soyabean oil) re charged 125 per cent duty. Other ts, oils and waxes are charged 60 per ent or 45 per cent basic duty. Most tty acids and alcohols are canalised rough STC.

araxylene

Import of paraxylene, an important arting material for the production of oth DMT and PTA, was taken off the GL list and canalised through the ublic sector IPCL on March 1, by ublic Notice No. 102. (It may be called that customs duty on the raw aterial was slashed to 45 per cent from per cent in the beginning of this ar.) After accounting for 45 per cent xiliary duty, the total duty on paraxene works out to 90 per cent. Addional duty is fully exempt where the d use is manufacture of DMT or PTA.

While the cut in the customs duty was signed to curb the landed price of port, the canalisation decision will otect the indigenous manufacturer. In s case, the major manufacturer of nthetic textile raw material, viz., CL, is also the canalising agency.

put-Output norms

The duty exemption scheme, the most pular among the import -- add value -- export schemes, was liberalised during the months of February and March. The scheme's thrust on pesticides was widened. Endosulphan as an export product along with the import items (Hexachloro Penta Diene, 1,4-Butendiol and Thionyl Chloride) were removed from the list and transferred to the general category "chemical and allied items". Two more import products, Epichlorohydrine and Carbon Tetrachloride, were added to the list against export of the pesticides. Twenty-one additional items under chemicals and allied products, eleven under plastics and one under processed foods were inserted in the lists. Minor amendments in the textiles sector were also announced.

The significance of these changes lies in the fact that the operation of the duty exemption scheme becomes simpler when the input-output norms are announced. In the absence of the norms, specific approvals are required. These take a long time.

INDIAN STANDARDS RELATING TO PETROLEUM, COAL AND RELATED PRODUCTS

The Bureau of Indian Standards has published the following new and revised Indian Standards relating to the field of petroleum, coal and related products.

IS: 716-1987: Pentachlorophenol (**second revision**); IS: 3400 (Part 3)-1987: Methods of test for vulcanized rubbers: Part 3 Abrasion resistance using a rotating cylindrical drum device (**first revision**); IS:3660 (Part 3)-1988: Methods of test for natural rubber: Part 3 Determination of ash NR:3 (**second revision**); IS: 3730-1988: High density polyethylene bucket (**first revision**); IS: 5158-1987: Phthalic anhydride, technical (**second revision**); IS: 5347 (Part 11)-1987: Requirements for orthopaedic implants: Part 11 Ultra-high molecular weight polyethylene, moulded form; IS: 7503 (Part 3)-1988: Glossary of terms used in rubber industry: Part 3 Definitions relating to properties and testing (**first revision**); IS: 7503 (Part 4)-1988: Definitions relating to processing (**first revision**); IS: 7619-1987: Pentaerythritol (**first revision**); IS: 9316 (Part 4)-1988: Methods of test for rubber latex: Part 4 Determination of total solids content R:L 4 (**first revision**); IS 9316 (Part 6): Determination of pHR:L 6 (**first revision**); IS: 12247-1988: Nylon-6 polymer for its safe use in contact with foodstuff, pharmaceuticals and drinking water; IS: 12248-1988: Positive list of constituents of nylon-6 polymer for its safe use in contact with foodstuffs, pharmaceuticals and drinking water; IS: 12252-1987: Polyalkylene terephthalate (PET and PBT) for their safe use in contact with foodstuffs, pharmaceuticals and drinking water; IS: 12304-1987: Plastic cervical collar.

Copies of the Indian Standards are available, from the Sales Services at BIS Headquarters at New Delhi and Regional and Branch Offices located at Bombay, Calcutta, Chandigarh, Madras, Ahmedabad, Bangalore, Bhopal, Bhubaneshwar, Guwahati, Hyderabad, Jaipur, Kanpur, Patna and Trivandrum.

GAS SUPPLY TO BRICK KILNS IN AGARTALA

The Oil and Natural Gas Commission (ONGC) has commenced supply of piped gas to its colony and school in Agartala. An ONGC spokesman said the town would be exposed to the supply during this financial year.

The spokesman said for the first time in India, gas is being supplied to brick kilns for heating bricks. So far, coal was in use. Till date three brick kilns have been converted to gas-fired brick kilns around Agartala town. ONGC supplied 25.2 million cubic metres of gas to the Tripura State Electricity Department for power generation in 1988-89.

Oswal may bid for Assam cracker

Mr. Abhey Oswal may put up a bid for a Rs. 1,700-crore gas cracker complex in Assam. The complex is likely to be based on dual feedstock of gas and naphtha. While details have not been finalised, it is likely that Mr. Oswal may finance a substantial part of the project through equity funds to be mopped up from the capital market.

Vam Organic Chemicals Ltd. had recently applied to the Union government for a letter of intent for the gas cracker complex. Vam has stated that it would invest Rs. 155 crores in the form of equity while the rest of the funds will be mobilised from the capital market, foreign exchange loans and convertible debentures.

The Assam State Industrial Development Corporation had also applied for a licence for the gas cracker complex way back in 1984. The complex is expected to come up near Jorhat, which is situated in upper Assam near the oil fields operated by Oil India Ltd. and Oil and Natural Gas Commission.

It is learnt that though the oil fields and the refineries in Assam are spread over a wide area, an efficient network of pipelines already exists in the state. Thus collection of feedstock at a central place like Jorhat can be undertaken at no extra cost. According to an autonomous study, Assam has sufficient reserves of gas and naphtha out of its refineries to set up a cracker plant with an annual installed capacity of around four-lakh tonnes of ethylene. The internal rate of return has been found to be attractive compared to other proposed gas crackers in the country. The break-even point is also lower at around 49%.

The Vam proposal envisages production of three-lakh tonnes of ethylene, 60,000 tonnes each of propylene and monoethylene glycol, polypropylene and acrylonitrile, and 45,000 tonnes of alpha olefins. Mr. Abhey Oswal is one of the latest entries into the petrochemical field after his acquisition of Union Carbide's petrochemical complex in Chembur. He has since been on the lookout for large petrochemical based projects.

Mr. Oswal has also put up a bid for the Rs. 725-crore gas-based fertiliser complex in Shajahanpur. Besides offering to mop up the entire capital cost of the project from the capital market in the form of equity, Mr. Oswal was also looking into the possibility of floating a Rs. 200-crore Euro-convertible bond to take care of the foreign exchange requirement of the project.

Mr. Oswal had earlier evinced k
interest in setting up a two-mill
tonnes per annum refinery in Ass
which was to be put up as part of
Assam accord between the Union go
and the All Assam Students Union. T
proposal was mooted in Delhi in fr
of the Assam minister of indust
Mr. G. Hazarika. But the proposal f
through after the Assam govt. insist
that the refinery be set up in the pub
sector. A decision on the proposed g
cracker complex in Assam is likely
be taken shortly by the Union go
based on the recommendations of
committee headed by Mr. Abid Hussa

ONGC LAYS NEW PIPELINE I GUJARAT

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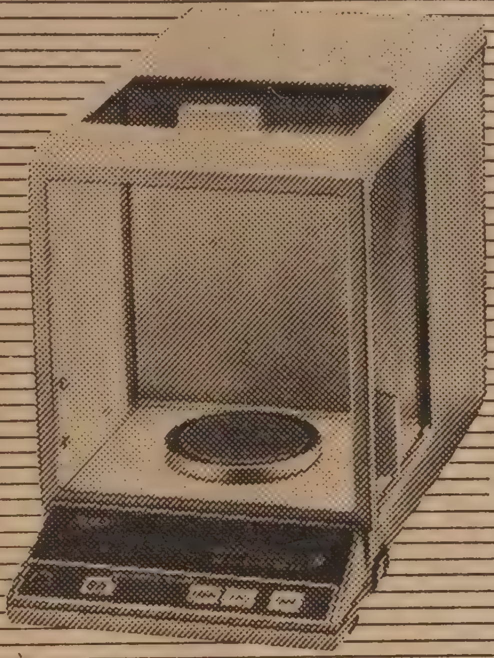

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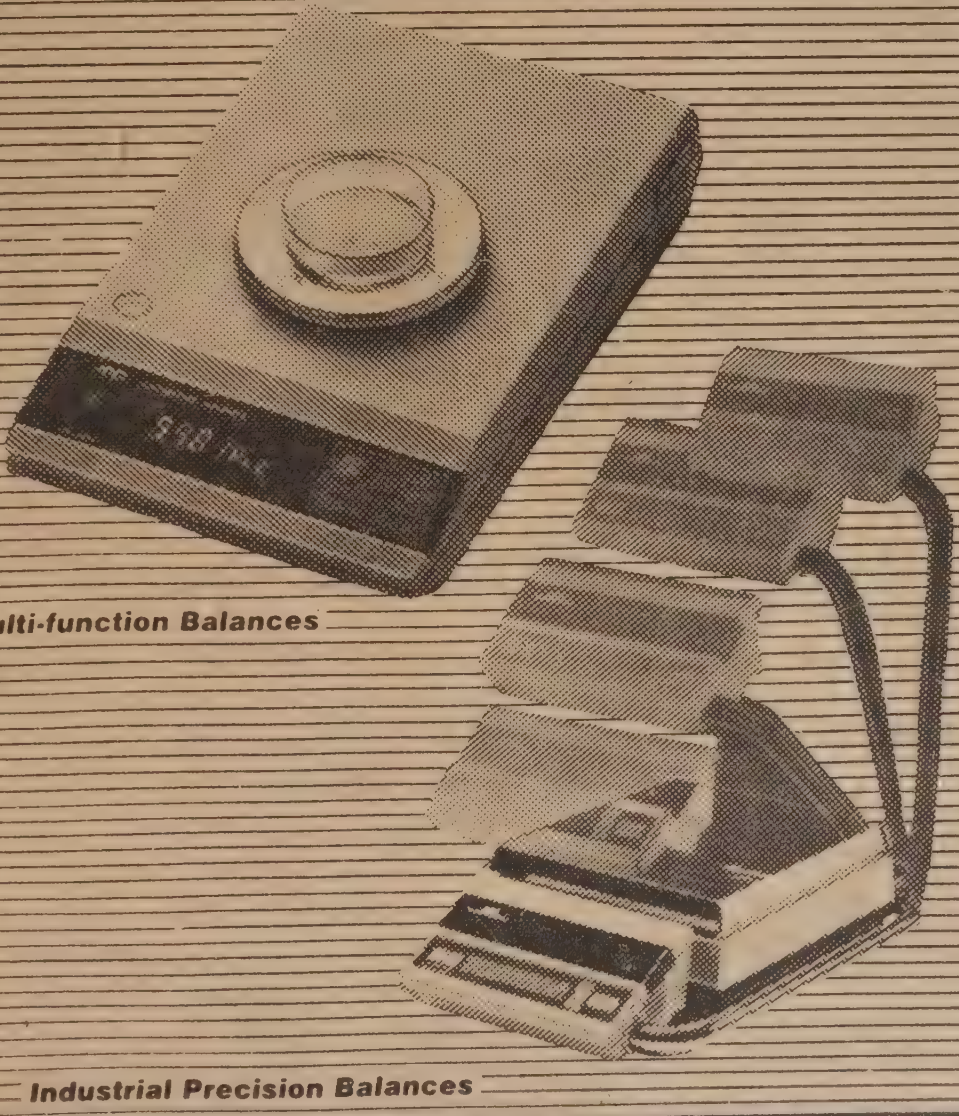

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Science Briefs

SEARCHING SUBSTITUTES FOR OZONE DESTROYING CHEMICALS

The earth's ozone layer is in danger. The biggest threat to the shield that protects the planet from lethal solar radiation is from the chlorofluorocarbon (CFC) chemicals now extensively used as refrigerants, propellants, bubbles in plastic and cleaning fluids.

With a number of countries pledging to phase out the ozone destructive chemicals completely by the year 2000, the search for alternatives has intensified. But researchers and chemists searching for these alternatives apprehend that the technical and economic cost of the switchover will be too high to withstand the economy.

Although potential replacements for the CFC chemicals now extensively used in the multi-billion dollar industries have already been identified, experts say the replacements are generally more expensive and less effective than the original chemicals. Equipment using some of the replacements, moreover, is expected to consume more power and wear out sooner.

The problems with the currently used CFCs is that released into the air from the bubbles in plastic foam, from leaks in defective or abandoned refrigerators and air-conditioning systems, from solvents used to clean computer circuits and other sources, these compounds rise over a period of years into the stratosphere, where intense sunlight breaks them down. The chemical products of these reactions go on to destroy ozone, a minor but important component of the upper atmosphere, which shields the earth from much of the sun's harmful ultraviolet radiation.

Spokesmen for major chemical companies say that $135 billion of equipment in the United States alone operates using the soon-to-be prohibited chemicals, and much of this equipment will eventually have to be replaced to accommodate substitute chemicals. The likely substitutes for the three main ozone-destroying CFCs may, in many cases, be effective. The main ozone-destroying refrigerant, CFC-12, could be replaced by a fluorocarbon called HFC-134a. CFC-12 consists of a single atom of carbon with two atoms each of fluorine and chlorine, and is easy to manufacture from two common chemicals. But HFC-134a contains two carbon atoms, four fluorine atoms and two hydrogen atoms, and is much more difficult to manufacture.

Chemical engineers say that the replacement chemical is likely to cost three times as much as CFC-12, and it may not last as long. The substance cannot be used in refrigeration equipment previously operated on CFC-12, partly because major corrosion problems would result.

The proposed replacement for CFC-11, a chlorofluorocarbon used to make plastic foam and in central air conditioning systems, is a compound called HCFC-22. This is a chlorofluorocarbon already in use in home air conditioners, but it is more expensive than CFC-11 and its potential applications are limited by its inferior characteristics. HCFC-22 is not as good a heat insulator as CFC-11, and is therefore unsuitable as foaming agent for insulating plastic foams. Moreover, its boiling point is too low for it to be useful as a refrigerant in automobile air-conditioners, unless the latter undergo major modifications.

Recently, Du Pont announced that it had developed two potential substitutes for CFC-113, the third important member of the ozone-destroying group. This chemical is used in foaming plastics and in other applications, but Du Pont's substitutes are suitable only for cleaning electronic components. The more promising of the two products, KCD-9438, a propriety blend of orga solvents containing no CFCs, will available for testing later this year, company said, and "may be acce able" for some customers. A seco product which contains some chlor fluorocarbons but in only sm amounts, will not be available comme cially until the mid-1990s. Both pr ducts are expected to cost about thr times as much as the present cost CFC-113.

Du Pont, which manufactures abo one-quarter of the world's annual pr duction of two billion pounds of chlor fluorocarbons, announced a few wee ago that it would phase out productio of these compounds. But the cost eliminating the chlorofluorocarbons wi be high. According to Charles McCain, Du Pont's manager for th development of alternative products, th more rapidly the chemicals are remove from industrial applications, the highe will be the cost.

Although the family of CFC includes many hundreds of compounds only the five considered most damaging to the ozone layers are poised fo a ban: CFC-11 and CFC-12 which ar used as refrigerants, CFC-113, use mainly as a cleaning agent, and CFC-114 and CFC-115, which have a variety of uses. The first three of these compounds constitute more than 90 per cen of CFCs used in the developed as wel as developing countries.

These chemicals have special properties that make them extraordinarily useful. Very little energy is required to convert them from gases to liquids or vice versa, owing to their low boiling points and high vapour pressures. This makes them ideal for refrigeration applications and as propellants in canned aerosol products. CFCs are so chemically unreactive that they do not cause corrosion and are completely non-toxic. When converted under pressure into liquids, they have an extradinary ability to wet any solid mater- they touch; they are much wetter an water. This perfectly suits them for eaning the microscopic pores, ratches and irregularities in computer rcuit boards, especially since they vaporate rapidly, leaving no residue. he substitutes in all these applications, anufacturers say, are a step backward product quality, except for the fact at they will be less damaging to the zone layer. They are expected to be ss durable, require redesign of much quipment, raise questions about their xicity. Many of the substitutes are ctually other CFCs whose chemical tructure has been designed to break own quickly in the lower atmosphere.

Leo Manzer, manager of research at u Pont, said the search for acceptable ubstitutes has already cost his company 100 million. The quest has focussed on ompounds that have one, two or three arbon atoms, along with varying com- inations of hydrogen, chlorine and flu- rine atoms. Mathematically, it gives 01 chemical possibilities and testing hem all for flammability, toxicity, sta- ility and engineering qualities is no imple matter.

If a refrigeration system contains FC-12, the compressor can usually perate for up to 30 years without a eed to replenish or replace the gas, xperts say. But it remains to be seen whether a substitute gas not based on chlorofluorocarbons will hold up for nearly as long. A likely substitute for many applications of CFC-11, which consists of one carbon atom, three chlorine atoms and one fluorine atom, will be a compound called HCFC-22 consisting one carbon, one chlorine, two fluorines and one hydrogen. Technically speaking HCFC-22 is a chlorofluorocarbon, but since it contains a hydrogen atom and only a partial complement of chlorine and fluorine atoms, it is regarded as environmentally safer than CFC-11. The hydrogen makes it more vulnerable to attack, and scientists believe that most of the HCFC-22 released into the air will be destroyed by sunlight before even reaching the stratospheric ozone layer. The compound would still destroy some ozone, but only a negligible amount, it is believed. The fact that HCFC-22 is already the refrigerant used in virtually all home air conditioners means that these machines will not be made obsolete by the phasing out of CFCs. The compound is not among the five CFCs singled out for elimination to curb destruction of the ozone layer.

However, if HCFC-22 were banned, it would simply be catastrophic for everyone. The reason is everyone is counting on it as a substitute. In response to a Du Pont initiative, the entire foam-polystyrene packaging industry switched this year from CFC-12 as a foaming gas to HCFC-22. Questions remain about the stability and long-term safety of HCFC-22, however, and testing will continue.

NEW ANTIBIOTIC 100 TIMES MORE POTENT

A new antibiotic 100 to 200 times more potent than that existing in the world now has been developed by the state-run Korea Institute of Chemical Technology at Daedok, South of Seoul. According to Dr. Kim-Wan-Ju, who heads the research team which developed the new antibiotic, it is particularly effective on chronic bronchitis, cystitis, cholecystitis, conjuctivitis, otitis, secondary infections after surgery and abscesses and other kinds of inflammation.

Named KR-10664, the new second-generation antibiotic is claimed to be effective against bacteria resistant to the first-generation quinolon-line antibiotics as well as the existing mrsa-line antibiotics. Plans are under way to seek a world-wide patent, when it is marketed in the form of medicinal products within a few years. South Korea will earn up to 50 million dollars a year over the expected sales amounting to 500 million dollars worldwide, he added. The sales of quinon-line antibiotics are said to amount one billion dollars a year now.

-- PTI Science Service

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DAP CHEAPER THAN PHOSPHORIC ACID:

Fertiliser imports may exceed budget estimates

The government is expected to import 23 lakh tonnes of diammonium phosphate (DAP) during the current year as against nine lakh tonnes during 1988-89.

This is evident from the bids invited by the government recently for handling and distribution of DAP and complex fertilisers during 1989-90. In the Union budget for the current year, the government had indicated that it would import 15 lakh tonnes of DAP.

It is learnt that at the time of the preparation of the budget, the government was not aware of the fertiliser department's inability to import phosphoric acid which is used for the manufacture of DAP. It is only now that the full impact of the non-import of phosphoric acid had dawned upon the government resulting in the upward revision of DAP imports.

The Minister of State for Fertilisers, Mr. R. Prabhu, had told the **Economic Times** that it was cheaper for the govememnt to import additional quantities of DAP and at the same time compensate the indigenous industry by giving it idle fixed charges rather than import phosphoric acid at the prices being demanded by phosphoric acid manufacturers.

However, inquiries reveal that the government has so far not issued any instructions for giving the idle fixed charges to the units closed due to non-availability of imported phosphoric acid so the industry is continuing to suffer losses.

Moreover, industry sources argue that it is yet to be seen if the required quantity of DAP is available in the international market. Once it is learnt that India is entering the market in a big way, DAP prices are also expected to go up substantially. In terms of nutrient P_2O_5 the production loss to the industry has been of the order of 2.5 lakh tonnes during January-March 1989. In terms of material, the loss comes to about 5.5 lakh tonnes.

During the current year also, the production loss will be 1.2 lakh tonnes per month till the arrival of the imported phosphoric acid. The worst affected is Paradeep Phosphates Limited which is entirely dependent upon the imported phosphoric acid for its production. It is a joint venture in which the Government of Nauru holds 49% equity. It has a capacity of 3.31 lakh tonnes of P_2O_5. Among the badly affected are Godavari Fertilisers at Kakinada, having a capacity fo 1.38 lakh tonnes of P_2O_5, GSFC, Sikka, with a capacity of 1.5 lakh tonnes of P_2O_5, and IFFCO, Kandla, having a capacity fo 3.09 lakh tonnes of P_2O_5. The cut in phosphatic fertiliser production is expected to have a back-lash on ammonia production.

This is because the excess ammonia with GNFC and Deepak Fertilisers, which was being supplied earlier to the phosphatic fertiliser manufacturers dependent upon imported phosphoric acid, is not being lifted now.

The production of phosphatic fertiliser at EID Parry is also expected to be hit since it is dependent upon imported ammonia, the import of which has also been suspended alongwith phosphoric acid.

Cartel of manufacturers:

There is a near crisis situation in the DAP supply this year, resulting from the country's dogged refusal to give in to an international cartel selling phosphoric acid and ammonia required for the production of DAP. The cartel is led by a Moroccon company, OCP Morocco, the largest producer of ph phoric acid and ammonia in the wo which has the second largest produc Phoschem of the US, as its partner. T two companies between them control per cent of the international marke

Sudden spurt in prices:

According to official sources at N Delhi, OCP Morocco, has sudder jacked up its selling price of phospho acid. Against the price of $375 a ton being quoted in the second half of 198 for the first half of the current year, t company had asked for a price of $5 a tonne. After protracted negotiation the price was brought down to $480 tonne, still substantially higher than t last quoted price.

At this point, the Department of Fe tilisers decided not to give in to th cartel since this would not be in th long-term interests of the country. Eve otherwise, the Department found th price quoted by the Moroccon compan 'ridiculous' since the cost of raw material for the manufacture of DAP wa turning out to be higher than the end price of the fertiliser. As per OC Morocco's quotations, the landed pric of phosphoric acid and ammonia fo manufacturing one tonne of DAP wa turning out to be around $280-290 whil the landed cost of one tonne of importe DAP was working out to only $240-250.

Against this background, it was decided to import DAP instead of its raw material even though it meant the closing down of indigenous fertiliser units.

Already six plants manufacturing DAP have closed down for want of phosphoric acid and ammonia and the others are operating at reduced capacity levels and are expected to down shutters in the near future. The economic situation of these units has also been damaged considerably with mounting losses and other consequent problems.

Moroccon Silos full:

The Moroccon economy is also eported to be severely affected due to educed offtake of phosphoric acid and currently all its storage capacity is said to be full of unlifted stocks. OCP Morocco also tried to legitimise its higher price for phosphoric acid by trying to increase the selling price of its DAP to European buyers. It has, however, not succeeded yet and all its storing silos are said to be full of DAP. The 'war of nerves' is therefore, on and it remains to be seen who gives in first.

India's indigenous DAP manufacturing capacity has, meanwhile, been considerably reduced and the country is said to have already lost 7-8 lakh tonnes of DAP production. With the refusal to buckle to Morocco, the expectation is that the production loss may eventually end up at around 10 lakh tonnes against the total production capacity of 20 lakh tonnes a year.

With the aniticipated normal rainfall, the consumption of DAP is estimated to be around 50 lakh tonnes and, to that extent, imports of about 23 lakh tonnes in the least are expected, on the expectation of some pick-up in domestic production. Last year DAP imports were around 9.3 lakh tonnes only.

Decision can wait:

But for the plight of the indigenous DAP manufacturing units, it is advantageous for the country to import finished DAP instead of phosphoric acid and ammonia for the manufacture of the fertiliser. But what has given optimism to the Department of Fertilisers to 'fight it out' with the international cartel is the fact that most of the DAP will be required after September this year and India,therefore, can wait for some more time. Additionally, the Orissa-based Paradeep Phosphates is expected to contribute to the indigenous production of DAP with its capacity of seven lakh tonnes annually. Moreover, this unit will manufacture its own phosphoric acid and ammonia for captive use.

SHIVALIK FERTILISERS

Shivalik Fertilisers Limited has completed its modernisation at a cost of Rs. 1.40 crores. It has adopted and innovated technology for the manufacture of SSP, which has been put in use for the first time in north India.

By adopting this technology, the company has achieved zero water discharge and there will be no air pollution as per Minhas standards.

It has registered 42 per cent and 61 per cent increase in production and sales, respectively, over the corresponding figures of last year.

INDIA SEEKS MORE CRUDE FROM SAUDI ARABIA

India has approached the government of Saudi Arabia for the renewal of its contract for the supply of crude oil and has requested an increase in its crude import from the present 50,000 barrels per day (BPD), to 70,000 BPD.

The Indian Oil Corporation Chairman, Mr. S.K. Khosla, recently held talks with the officials of the Saudi oil company Aramco in Damam for renewal of the contract and increased supply of crude.

He later told Arab News, a Saudi English daily, that he did not find any hitch in the renewal of the contract. According to him the Aramco officials have agreed to reconsider India's requirement and its fresh request. Saudi Arabia is the second largest crude oil exporter to India after the Soviet Union. Apart from these two countries, India imports crude oil from Iraq, Iran, Kuwait and the United Arab Emirates.

Recently India signed contracts with Kuwait and United Arab Emirates for supply of crude oil and other petroleum products.

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Report on Indian team diluting stand on patents denied by government

The ministry of commerce categorically denied the report in a section of the press that the Indian delegation in Geneva had watered down India's stand on patents and intellecutal property rights in the Uruguay round of multilateral trade negotiations.

India's primary effort has been to ensure that discussions under Gatt on trade-related aspects of intellectual property in the Uruguay round conceded at Punta Del Este do not, in any way, prejudice the interests of the developing countries or pre-empt discussions in the World Intellectual Property Organisation (WIPO) and elsewhere. A press release issued by the ministry on April 9 stated that this position has been fully safeguarded.

The consensus in Geneva, in fact, on the insistence of the Indian delegation, has been that there should not be any pre-judgment on the relationship of the issue of intellectual property rights with Gatt at this stage of the multilateral negotiations.

India stands, according to the release, for the right of the developing countries in any multilateral negotiations taking into account their development dimensions and their national policies directed towards giving their people a better life.

On intellectual property rights, India has consistently and successfully presaged the point both at Montreal and currently in Geneva that the particular needs of developing countries as well as the concerns of countries at different stages of development ought to be fully taken into account in any negotiations if it is to be acceptable to India. Therefore, while recognising the need to reward innovation, it is imperative that in view of the special concerns of the developing countries, a balance has to be maintained with the developmental, technological and public interest objectives of the developing countries.

CHEMECH LAB TIE-UP FOR NEW DRUGS

Chemech Laboratories Ltd., a Madras based pharmaceutical company has entered into an agreement with Institute Massone, Argentina, for manufacture of specialised drugs used in treatment of infertility and invitro fertilisation.

The Argentine firm is a pioneer and world leader in the production of specialised hormones like HCG, HMG and pure FSH. Chemech Laboratories will initially market these items in the country and proposes to go into manufacture within a year.

According to Mr. T.S. Jaishankar, Managing Director of the company, these drugs, manufactured from hu
menopausal urine are used in pati
with problems in pituitary glands.
success rate has been in the regior
97 per cent the world over.

In India too, the success rate has b
quite high after treatment with impor
drugs. When produced in India, th
will be over 30 per cent cheaper in te
of price than they cost now, he t
newsmen recently.

Mr. Raul Massone, President, Ins
tute Massone, who has signed a me
orandum of understanding w
Chemech Laboratories, said the dru
enjoy a $400 million market in
world with the US accounting for mo
than $100 million.

He noted that there has been a t
mendous increase in demand for the
drugs in India. He estimated that nea
10% of the couples in the world suffe
from infertility and a major part of the
due to problems in the pituitary glanc

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ESPONSIBILITY OF PROCESSING GAS

Compromise formula worked out

The petroleum and natural gas ministry has worked out a compromise formula to resolve the controversy over transfer of responsibilities of transporting, processing and marketing of natural gas from the Oil and Natural Gas Commission (ONGC) to the state-owned Gas Authority of India Limited (GAIL).

Accordingly, all gas-related business would be transferred to GAIL in phases. The compromise decision of the ministry follows extreme stands taken by ONGC and GAIL on this issue. While ONGC wanted to retain control over gas-related business, GAIL pressed for the transfer.

At present, almost the entire gas-related business is conducted and supervised by ONGC. The construction and maintenance of the HBJ pipeline, and supply of gas through it are the only gas-related responsibilities that presently vest with GAIL.

The decision on a phased transfer has been taken following a review of the present status by the ministry. Consultations with senior officials of ONGC and GAIL were held.

Although diametrically opposite stands were expectedly taken by representatives of the two organisations, the ministry was able to hammer out a solution that should make both the organisations happy.

During these discussions, GAIL insisted on the transfer arguing that this was a natural corollary to its creation as an independent public sector enterprise. In fact, GAIL had even written to the ministry saying that it should be wound up and merged with ONGC if the gas business was not transferred to it.

LAGOON TO BE BUILT IN MANALI TO TREAT SEWAGE

A Rs. 70-lakh lagoon will be constructed in the Manali industrial belt to give secondary treatment to sewage water and its recycling for use of units in the belt. This will enable the Madras Metropolitan Water Supply and Sewerage Board, the agency responsible for water supply to the city and industries, to augment its supply.

According to a note on the system laid in the assembly on April 10, the board had decided to give secondary treated sewage water from Kodungaiyur treatment plant to industries in the Manali belt, who will put up tertiary Treatment plants at their own cost to further treat the water to the requirements. An aerated lagoon will be constructed by the board during the current year to balance the secondary treated effluent to be supplied to industrial units.

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BHEL contacts ONGC for Narimanam gas

The Trichi unit of BHEL and ONGC are in discussions for bringing the natural gas produced in Narimanam, Kovilkalappal, and Bhuvanagiri oil fields for heat treatment purposes at BHEL to save the present consumption of coal.

BHEL is also considering the setting up of a 6 mw gas turbine plant in Trichi based on the natural gas to be supplied by ONGC. This was disclosed by Mr. K. Ramakrishnan, Executive Director of BHEL, Trichi, at a press conference at Trichi on April 6.

Mr. Ramakrishnan pointed out that the daily requirement of coal is of the order of 60 tonnes. There are also many constraints in bringing the coal. The Trichi unit is, therefore, having discussions with ONGC whether the natural gas produced in Bhuvanagiri and Narimanam could be brought through pipes. The daily requirement of natural gas is estimated at 1.5 lakh cubic metres.

Mr. Ramakrishnan said that they had entrusted to ONGC the task of preparing a project report. BHEL has also decided to enter new fields like undertaking renovation and modernisation works of power plants in the country, according to Mr. Ramakrishnan.

The United States Agency for International Development (USAID) had approved BHEL's four major research and development projects related to development of slagging combustor for advanced power generation applications, development of pollution control strategies for the power plants, characterisation of Indian coal mines for combustion gassification and advance diagnostic studies of life expectancy of existing power plants.

BHEL, in association with the International Development Research Centre (IDRC), Canada and Indian Institute of Technology, Bombay, would also set up a research facility for circulating fluidised bed combustion boiler.

Mr. Ramakrishnan said BHEL had achieved a turnover of Rs. 787 crores during 1988-89, an increase of Rs. 16 crores over the previous year. The turnover in Ranipet boiler auxiliaries plant was Rs. 168 crores.

He said that there was a significant improvement in productivity during the year with a three per cent rise in value added compared to 1987-88.

It has also embarked upon a programme of diversification and has proposed to take up the manufacture of
tain items for the Defence Departn
This would be to the value of a
Rs. 30 to 40 crores, Mr. Ramakrish
added.

OIL DRILLING FACILITY IN PRIVATE SECTOR

The first facility in India for the n
ufacture of sophisticated oil drilling
production equipment in the pri
sector was launched at Gurgaon on
Delhi-Jaipur high-way on April
by the Union Minister of State
Petroleum and Natural Gas, Mr. Bra
Dutt.

Baker Oil Tools India Private Ltd
a joint venture of which 40 per c
equity is held by Baker Huges, a $2
lion U.S. corporation. The other 60
cent of the equity is in the hands of
ident Indians.

According to Mr. Hiroo Khushala
the managing director, Baker Oil To
has already commenced productio

In a full year the company would
able to manufacture a sizeable part
the equipment which is now impor
in its entirety, the foreign exchan
outgo being Rs. 50 crores.

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Highlights in Chemical Technology (Part 2)

LCAN ALUMINIUM TO RODUCE NEW CERAMIC IATERIALS

Alcan Aluminium of USA has almost mpleted construction of a plant for the roduction of new ceramic materials in uebec, Canada. The plant will be cated near the existing Alcan esearch Centre and has begun produc- on in December 1988. It will use a new rocess for making carbides and other onoxide ceramics.

Initial ceramic materials to be made t the plant, such as silicon carbide ub-micron powders, fibres and whisk- rs, are used in the reinforcement of eramic and metal matrix companies. ater, production will will include sil- con and aluminium nitride powders and ullite whiskers. Alcan has filed for atents for its new process. (C & EN, /26/88, p. 10).

NOVEL GAS-WELDING ECHNIQUE BASED ON LECTROLYSIS AND MICROCHIPS

A Swiss chemical company (Rochem) has developed a gas welding tool that runs on water. The developers have harnessed the process of electrolysis to produce hydrogen and oxygen from water, which avoids the expense of buying, transporting and storing bottles of gas. This makes the new system ideal for welding on ships and for other places like remote farms, where it is hard to obtain supply of oxygen and acetylene for the conventional oxyacetylene welding.

The new system can produce 5000 litres of gas from just 3 litres of water. It is far safer than oxy-acetylene welding because it produces only the exact amount of gas it needs at any one time.

The hydrox generator, as the new system is called, uses an ordinary fuel cell as its source of gas. Researchers have tried in the past to extract these gases from water by electrolysis but it has proved difficult to produce enough gas, at a workable pressure. Rochem, the Swiss company that makes the units, uses complex control systems based on microchips to manipulate its welding torch.

Hydrogen gas is the critical component of the process, although oxygen is also necessary if the flame is to burn. The mixture of hydrogen and oxygen obtained from the water is cleaned of its mineral impurities, dried and then passed through a hydrocarbon. The existing range of models use toluene, although the manufacturer may use other hydrocarbons in later models. The toluene ensures that the flame is hot enough to use. The process mixes small and precisely controlled quantities of the toluene with the gas, which then goes directly to the welding torch. The flame is close to being symmetrical which means the welder can position it easily.

The profile of the flame in the device is exactly opposite to that of an oxyacetylene flame. The flame is hottest at its core. This also helps the welder to position the torch accurately. The unit ensures that the pressure of the gases on the tip of the torch remains steady, regardless of distance between the operator and the source. This enables the welder to work at greater distances from the source of gas than has previously been possible.

Acetylene cannot be supplied safely at a pressure of more than around 1 kg. per sq. cm. This means that in long pipelines the pressure could drop so low that it impossible to use. Initial costs of the new device are high from £3,000 from £15,000. A conventional oxy-acetylene welder needs only one cylinder each of oxygen and acetylene and a torch. This costs around £100 to £120. (*New Sci.*, 10/15/88, p. 36).

A NEW PULP BLEACHING PATENTED TECHNOLOGY PROMISES HIGHER BRIGHTNESS PULP WITH LOW COST AND ENVIRONMENTAL POLLUTION

FMC (Chicago) has recently acquired patented technology for pulp bleaching that it reports offers higher brightness pulp, bleach chemical savings, and reduced effluent colour and chlorine use.

The new process takes advantage of the synergistic effects of using hydrogen peroxide and oxygen together in an alkaline stage of the kraft pulp bleaching process. FMC is keen on development of this technology in the kraft pulp industry. Therefore, it has bought US Patent 3,719,552.

One of the most promising uses of this technology is its potential to reduce overall chlorine use in the kraft bleaching process. The adoption of this technology will support the rapidly growing market for hydrogen peroxide in the pulp and paper industry. (*Chem. Wk.*, Jan. 4/11, 1989, p. 50).

THE WORLD'S FIRST POLYSTYRENE RECYCLING UNIT MAKES A DEBUT IN USA

The world's first polystyrene recycling unit made a debut in USA last

December in Leominster, Mass. This unit will be able to recycle 1360 tonnes/year of polystyrene foam products. This recycling unit has been opened by Mobil Chemical and Genpact Corporation.

Their objective is to increase the public awareness of the recycling potential of plastics in terms of environmental benefits and commercial enterprise. The joint venture has been aptly called 'Plastics Again'.

Plastics producers have been recycling process wastes for some years, so technology is not a major problem. The difficulties are, organising the collection of plastics and developing a process to clean incoming material. The new plant will initially recycle foam products and plastic cutlery used in school and industrial cafeterias. Later, it will take in foam products from fast food outlets as well.

The companies feel there is a strong market for recycled polystyrene foam, particularly in the insulation and industrial packaging sectors. A recent study put the volume of plastics recycled in USA in 1987 at 458,000 tons and estimates an increase to 2.2 million tons by 1998.

The report, 'Recycled Waste Plastics – Markets and Profit Opportunities' was compiled by New York based industrial consultant R.M. Kossoff & Associates. It predicts the total world volume of plastics recycled will grow from 900,000 tons in 1988, to a 4 million tons by 1998. The 1988 figure represents 2% of the total volume of plastics consumed, while the 1998 volume accounts for 7% of predicted usage.

According to the study, packaging offers the greatest initial worldwide recycling potential, while automotive, construction, electrical and electronic uses could offer significant potential over the next decade. (*ECN, Jan. 2/9, 1989, p. 16*).

AN ENERGY-SAVING CHLOR-ALKALI PRODUCTION PROCESS DEVELOPED BY PHYSICAL SCIENCES INC.

Energy savings of as much as 30% in chlor-alkali production of a process was recently unveiled by Physical Sciences Inc. (Andover, Mass, USA) at the 1988 meeting of the American Institute of Chemical Engineers. PSI's electrochemical caustic concentration substitutes for present thermal evaporations, which consume up to one-third of the energy used in chlor-alkali plants, to concentrate caustic from 30 to 50 wt%.

The concentrator, basically a fuel cell, uses 30% W/W NaOH from the chloralkali process as electrolyte, by-product hydrogen from the chloralkali cells and oxygen from air. In the concentrator, oxygen and water react in the cathode section to produce hydroxyl ions, whereas H_2 and OH ions react to form water in the anode compartment. The cation membrane permits sodium ions to pass from the anode to cathode side, increasing the caustic concentration. The overall reaction produces d.c. power that could be used in the chloralkali process, reports P.S.I.

Currently PSI employs a membrane based on Du Pont's Nafron polymer, and has developed platinum gold-carbon electrodes that can tolerate high caustic concentrations. By October 1988, the firm is planning to commence a process development unit, a 50 cm² single cell producing about 300-400 mV at a current density of 100-200 mA/cm². The work is being funded by the US Department of Energy through mid 1989. (*Chem. Eng.*, 8/12/88, p. 19).

CATALYTIC DETOXIFICATION OF CHLORINATED ORGANICS CAN PROVE MORE EFFECTIVE AND LESS EXPENSIVE

Catalytic detoxification of chlorinated organics is reported to be more effective and less expensive than incine
tion, in a route being developed by
chemical engineering department of
University of California (Los Angele
UCLA has achieved 97% or more co
version of chlorobenzene and dichlo
obenzene in a screening study
identify the best catalysts.

An advantage of this new catalyt
process is that it is done at 350°C, cor
pared with incineration at 1200-1600°
It does not require oxygen and is le
likely to produce dioxin. The develop
of the process Bijan Hagh did the tes
in a batch autoclave reactor, in whic
the chlorinated compounds are reacte
with hydrogen at 1,000-1,500 psi, int
hydrogen chloride. Best results we
obtained with a presulfided nicke
molybdenum catalyst on an alumin
substrate (99.2% conversion of chlor
obenzene and 96.9% conversion o
dichlorobenzene), and with reduced pal
ladium on alumina (99.6% and 96.9
respectively). Currently, UCLA is start
ing up a continuous flow reactor t
further develop the process. (*Chem
Eng.*, 10/12/88, p. 19).

A ONE-STEP PROCESS FOR CLEANING UP COPPER REFINERY LIQUORS DEVELOPED BY HENKEL CORP.

A one-step process for cleaning up copper electro-refinery liquors was unveiled recently by the technical director, Gary Kordosky of Henkel Corpis Mineral Industry Div. (Tucson, Ariz). Kordosky reported that pilot tests have removed more than 90% of the Bi and Sb and more than 80% of the arsenic, metals that build up in process liquors, ultimately reducing copper purity. At present many refineries have problems with one or more of these elements and the impurities are becoming increasingly prevalent in copper ores.

Conventionally, the impurities are removed by a costly, multi-stage electro-winning process, followed by returning the material to the smelter.

enkel's route promises to be more onomical since it uses a single rea-ent, a chelate dissolved in kerosene, hich binds with all three metals amely Bi, Sb and As). The chelated etals are precipitated as sulfides by parging hydrogen sulfide gas, then filt-red out for disposal.

So far, the new process has been ested on a small bleedstream at an uni-entified copper refinery. By early 989, Henkel will have a larger pilot lant in operation at an European refin-ry, this pilot unit will be able to handle bleedstream of about 150 ml/min -- nough to control the impurities in a ull-size electrorefining cell. (*Chem. Engg., 9/12/88, p. 17*).

A GERMAN PROCESS TO REDUCE FLYASH EMISSION FROM HAZARDOUS WASTE NCINERATOR

An ingenious way to cut flyash volumes 15-fold from hazardous waste ncinerators has just completed pilot esting and is ready for commercial scale operation. Deutsche Babcock (Krefeld, W. Germany), in cooperation with the Nuclear Research Centre (Karlsruhe), has finished the 3-R process (for Rauchgas-Reingung mit Ruckstands -- behandlung) on a $800,000 pilot plant attached to a 20 tonnes/hour (of garbage) municipal-waste incinerator at Oberhansen.

Fluegases from the incinerator are cleaned in an electrostatic precipitator and then washed with water. The chlorine in the gases acidifies the water, typically to a pH of about 1. A portion of the scrubber wash-water -- about 0.7m/hour -- is fed to the 3-R pilot plant, where it is stripped off mercury in an ion-exchange column.

The washwater is then stirred for 30 min at ambient temperature and pressure with 60 kg/hour of flyash -- about 10% of the total captured in the electrostatic precipitator. This solubilizes more than 98% of the cadmium and 40% of the zinc in the flyash.

The mixture is vacuum filtered, and the filtrate is treated with calcium hydroxide to precipitate a heavy metal sludge (2 kg) which is disposed of as a hazardous waste. The remaining solution can be discharged as wastewater. The filter cake (15-20 kg) is re-fed to the incinerator, where it combines with molten slag, which, when cool, forms a non-leachable glassy material, that can be landfilled. Operating costs for a commercial scale unit are estimated at $3-3.50/tonne of waste. (*Chem. Eng.*, 9/12/88, p. 17).

CATHODIC PROTECTION (CP) INDUSTRY MOVES INTO HIGH GEAR IN USA DUE TO EPA'S STINGENT REGULATION ON LEAKING UNDERGROUND STORAGE TANKS

The USA's Environmental Protection Agency (EPA) is on the verge of finalising rules for Leaking Underground Storage Tanks (LUSTs) containing petroleum and chemical products. Underground hazardous waste tanks have been regulated since July 1986.

For petroleum tanks, the new rules require protection against corrosion either by cathode protection, cratings or through the use of tanks made of fibreglass-reinforced plastic. Tanks containing chemicals must have dual-containment systems, with a leak detector between the two layers.

Thanks to these new regulations the cathodic protection (CP) industry is moving into high gear. More than 2 million storage tanks, mostly for storing fuel, will have to be replaced or upgraded. Although many firms are expected to replace their tanks with ones made of fibreglass reinforced plastics, many others are expected to opt for upgrading existing steel units with cathode protection. Amoco Oil Co. for example, has already embarked on a $90 million programme to install CP on its 18,000 steel tanks.

Besides EPA, the US Federal Highway Administration (FHWA) has endorsed that CP is the only rehabilitation technique that has been proven to stop corrosion of steel rebar used for reinforcing bridge decks. The FHWAs strategic Highway Research Programme has found that it will cost around $20 billion to make corrosion-related repairs on bridges and related structures in USA. Therefore, steel rebar corrosion in concrete can open-up the largest market in the coming years for CP industry.

Equipment in chemical process industry plants is typically made of different metals because requirements for mechanical integrity, corrosion resistance and economics vary from structure to structure in a facility. However, when several dissimilar metals are in physical or electrical contact (the latter via a conductive electrolyte, such as a process fluid or soil), galvanic corrosion can take place. For example, if a copper tube leads into an iron pipe, the more active metal (iron) suffers accelerated corrosion, while the corrosion process is slowed down for the less-active one (copper).

The galvanic corrosion process is similar to the action of a simple d.c. cell, in which the more active metal becomes an anode (and corrodes) and the less active metal becomes a cathode (and is protected). Researchers have over the years determined a galvanic series of metals/alloys that allows them to predict which metals corrode when in contact with others.

Generally graphite, platinum, stainless steel, bronze and copper are protected at the expense of iron, aluminium, zinc and magnesium (the most corrodable metal). Overall, the amount of corrosion by the process can be considerable -- for example, one ampere of current can destroy up to 20 lbs of steel every year.

Electrochemical corrosion can also occur when there is difference in electrolyte concentration between two ends of a structure built from a single metal. For example, in an underground steel pipeline, differences in soil conditions, such as moisture content and resistivity, create cathodic points on the top of the pipe (which is protected), and anodic points at the bottom (which corrodes).

Galvanic corrosion can be stopped by connecting a structure to a sacrificial anode made from an even more active metal, such as cast magnesium, zinc or aluminium alloy, which corrodes, thus protecting the structure. Sacrificial anodes are generally limited to units requiring currents of less than 3-4A (the ideal voltage for CP varies depending on the metals and environment involved, but commonly runs around 4). For larger structures (requiring higher currents), designers prefer impressed current anode systems. Here the structure is connected to the negative terminal of a d.c. power supply; an anode made from a noble metal, is connected to the positive terminal. Current flows from the anode to the structure, which becomes cathode thus protecting it.

Recent years have seen rapid developments in anodes. In the past, the main choices available to chemical engineers were massive anodes of graphite or silicon-iron alloys. One problem with these anodes is that they are consumed rapidly. As a result if CP system is to have a life of ten years, an anode mass of several hundred pounds is necessary.

Superior anodes have recently been developed since 1980. Oronzio de Nora (Bioggio, Switzerland) and Elgard produce anodes in which the base is a ductile, corrosion resistant base metal, such as high purity titanium or niobium. Because the surfaces of these metals form an insulating layer in oxidizing conditions, they are coated with a conductive film of precious-metal oxides. Oronzio rules an electrocatalytic film of mixed metal oxides, which form a solid solution with the titanium; the coating is tailored to the environment in which the anode will be used. The resulting composite called LIDA -- Linear Distributed Anode -- has a low electrical resistivity (about 10^{-5} ohm cm) and a high current output (100-600 A/m^2, depending on the application). Because material dissolution is minimal -- about 0.5-5 mg/(A) (yr) -- the products can be used for up to 20 years.

Another version of this type of high-efficiency anode is from Matcor Inc. (Doylestown, Pa.). The anode is made of three co-extruded metals: a copper core, a mobium layer and a platinum cladding. The copper core increases the conductivity of the anode and distributes the current evenly, while the platinum cover acts as the actual anode. These newer anodes are smaller and weigh considerably less. Matcor's units, for instance are in dia and weigh about 25 lb vs 8 in and 180 lb for comparable graphite units. (*Chem. Eng.*, 9/12/88, p. 29).

NOVEL STRONG & FLEXIBLE METALLIC GLASS BASED ON ALUMINIUM DEVELOPED

Single phase glassy alloys rich in aluminium have been smelt spun into continuous ribbons by researchers at the University of Virginia, Charlottesville. The ribbons about 15 mm thick and 1 to 2 mm wide are 'very flexible and can easily be bent in half without fractioning' report Y. He and Joe Poon of the Physics Department, and Gary J. Shiblet of the materials science Department. By contrast amorphous alloys containing somewhat lower levels of aluminium that were made at other labs using different techniques were reported to be brittle. The Charlottesville alloys have compositions of $Al_{90}(Mo\ Lo)_{10}$ or $Al_{87}(Mo\ Lo)_{13}$, when M is a metal such as iron, cobalt, nickel or rhodium and L is a lanthanide such as cerium.

The tensile strength of some these alloy ribbon greatly exceeds that of the strongest commercial aluminium allo the researchers note.

The strongest alloy they test $Al_{90}Fe_5Ce_5$ has a tensile strength 940 mega Pascals. The Young's mo ulus of these metallic glasses though lower than that of crystalline aluminiu alloys. Similar results were report recently by a team at Tohoku Unive sity in Sendai, Japan. (*Science*, 24 1640 (1988); *C & EN*, 9/26/88, p. 2

R-P TECHNOLOGY CUTS NOx

France's Rhone-Poulenc has grante seven licences for catalytic reacto which reduce nitrogen oxide emissio from nitric acid plants. Reactors a being installed at ICI's Wilton an Ardeer sites in the UK, at Nors Hydro's Glombfjord facility in Norwa at Lonza's Visp, Switzerland unit an at Kemira's Rotterdam works in th Netherlands. The agreements includ licensing of the technology, but als encompass in some cases the provisio of basic process engineering and assis tance with commissioning of the nev plants.

Rhoné-Poulenc's patented nitroge oxide reduction process is carried out i two stages. Gas streams from nitric aci manufacture, initially pass through high efficiency absorption colum which recovers nitrogen oxide as nitric acid. The second stage, which is optional depending on the degree of NOx reduction required, is based on a catalytic reactor.

Selective catalysts convert remaining nitrogen oxide into nitrogen and water. Emissions can be reduced to meet international standards. European regulations limit the emission of nitrogen oxides to 200 ppm. While old plants are exempt from this standard, as soon as they are updated or expanded they have to comply. Rhone-Poulenc says its process allows companies to achieve emissions levels way below the EEC limit.

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Clean Water for Cosmetic Production*

S.M. SHANBHAG
Lakme Limited

INTRODUCTION

Water is one of the most widely used raw material for cosmetic preparation. Cosmetic products are made for skin application and skin care forms part and parcel of cosmetic usage.

Water plays a major role in health of skin. Water acts as plasticiser or softening agent for keratinous substances like nail, hair and skin. Water acts as a solvent for variety of cosmetic active ingredients. It acts as moisturiser alongwith certain ingredients. It also acts as carrier for emollient substances.

Water forms significant proportion of shampoos, bath products, spirituous preparation, soaps and emulsions. Potable water made available in different cities and towns is the major source of process water for cosmetics. In addition to these sources many industries uses well water. All these sources of water contain dissolved organic and inorganic matter.

Among the non volatile substances major concern are the inorganic cations such as calcium, magnesium and iron. The anions are usually chlorides, sulphates and silicates. Hardness of water is the indication of amount of polyvalent cation. The potable water available in Bombay city is fairly soft. Chemical impurities present in water are objectionable for cosmetic preparations.

In manufacture of colognes and after shave lotions which contain water to the extent of 15 to 40%, trace quantity of calcium, magnesium, iron and aluminium can give rise to slow formation of insoluble residue. In addition, presence of phenolic organic compounds like antioxidants and UV stabilisers can be the cause of discoloration.

In the field of emulsion technology it is well known that presence of large inorganic ions such as magnesium and zinc can disturb the performance of emulsifiers. The presence of such ions give extremely unpredictable viscosity characteristics in creams and lotions.

Many of the cosmetic raw materials are based on vegetable oils and their derivatives. The metallic impurities such as copper, zinc, iron can act like catalyst for inducing oxidation resulting in rancidity and bad odour. Use of deioniser for removal of dissolved mineral impurities is a general practice used in every cosmetic factory.

A proper set up of deionisation and other purification steps eliminates most objectionable chemical impurities. Bacterial contamination is a major concern in supply of process water for cosmetic preparation.

It is a well known fact that deioniser resin bed acts as filter and breeding ground for water borne bacteria. Most often it is the cation bed that is affected. But in mixed bed deioniser the entire system is affected. Occasional treatment of deioniser bed with formaldehyde solution or chlorine compounds like sterimeine (chloro melamine) has been suggested to decontaminate them. However these methods alone does not give consistent results.

MICROBIAL STANDARDS

There are no explicit microbiological guidelines for cosmetics in Drugs and Cosmetic Act. However, Bureau of Indian Standards has published guidelines for hygienic manufacture of cosmetics. The guidelines mentions that:

> "Cosmetic manufacture does not at present require the end product to be sterile. However, it is expected that bacterial count should not exceed 1000 org/gm with no pathogen".

The guidelines mentioned in ISI document is based on CTFA guidelines published by Cosmetics and Toiletries Fragrance Association of USA. There is very slight difference in American guidelines which differentiates baby products and eye products from each other.

A. Baby products	nor more than 500 org/gm.
B. Products used about the eye	
C. Oral Products	not more than 1000 org/gm
D. All other products	

In addition to microbial limits specified, no products shall have microbial content recognized as harmful to the user as determined by standard plate count method.

SOURCE AND MICROBIAL CONTAMINATION AND ITS EFFECTS

There are two major sources of microbial contamination in cosmetic products:

1. Water
2. Other cosmetic raw materials especially materials of mineral origin like kaolin, talc, magnesium carbonate.

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* Paper presented at the Prof. J.V. Bhat 75th Birth Anniversary Seminar on "Clean Water -- The State of the Art" for Food, Pharma and Cosmetics Industry held in Bombay on 4th March 1989.

Since process water is a major raw material in cosmetic preparation it is essential that it should be controlled. Contaminated process water can lead to:

1. Major source of contamination of entire manufacturing system.
2. It can create public health hazard.
3. It can degrade the cosmetic product in colour, odour and clarity.
4. High microbial content of water can lead to failure of preservative system.

PURIFICATION METHODS

Water Treatment Methods

Depending on microbial content of incoming water, many different methods or combination of methods may be used to produce microbiologically acceptable process water.

Chemical Methods

A. Chlorination

Chlorine and chlorine donating compounds are widely used because they are relatively inexpensive and easily monitored and effective at low concentration (1 to 2 ppm) after short contact time. The disadvantages are that chlorine is corrosive at high concentration and it is a respiratory irritant and it is inactivated in the presence of organic residuals and a pH levels above 8.5.

B. Iodination

Like chlorination, iodination can be easily monitored. Unlike chlorine, iodine is not easily inactivated by residual organic materials. It is slightly more expensive than chlorine and it is active over pH range of 5 to 9.0 and it is also a respiratory irritant and exerts a corrosive effect at higher concentrations.

C. Ozonation

Ozone has strong oxidising effect which is rapidly lost as it decomposes into oxygen. It is less affected by temperature and pH changes. It is a safety hazard. The permissible air borne concentration is 0.1 ppm.

Physical Methods

Filtration

Depth filters are systems of utilising candles made of cellulose or other resins and quite effective in reducing microbial load. The candles are made out of different pore size distribution. Process water is usually pumped through a series of candles of different pore sizes ranging from 10 to 0.4 micron. Unlike the chemical method, this procedure has no chemical residue or safety hazards for personnel. Filters ha to be monitored because channels which permit microbial pa sage may develop at any time. In addition, the build up particulate matter will reduce the flow rate. The overall inves ment is low and this procedure is relatively inexpensive

Distillation

Distillation effectively removes microbial elements with out introducing residual chemicals. This is a very expensiv method of water treatment as it involves high capital inves ment and high energy consumption. As such this procedur is rarely used for process water for cosmetics.

Heat treatment

This procedure involves heating process water to high tem perature in the storage bin for sufficiently long time. Thi procedure consumes large quantities of energy and the con tact time has to be controlled so as to ensure biocidal effects The high temperature also represents a potential personne safety problem.

Reverse Osmosis

It is an effective method which removes 99% of microbial contamination without introducing chemical residues. I can replace deioniser bed which is the main source of microorganism. Initial reverse osmosis costs are higher than chemical treatment but lower than distillation. The reverse osmosis membrane is sensitive to pH of incoming water and care has to be taken so as not to destroy the membrane. Reverse osmosis does not pose any personnel safety problems.

Ultra Filtration

Ultra filtration like reverse osmosis removes most micro organism without introducing chemical residues. The membranes utilised for ultra filtration could be regenerated. The costs are lower than that of reverse osmosis method but considerably higher than chemical methods. There is no personnel safety problem.

Ultra Violet Irradiation

Ultra violet irradiation procedures are used with good results. Ultraviolet radiation kills most vegetative microbial elements if maximum water depth is not more than 3/16th of an inch. This treatment does not introduce chemical residues and can be used at various points in the system. At the point of water use personnel must be shielded from eye damage from irradiation.

Depending on the needs of the consumer, sometimes two different procedures of purification are followed one after another to achieve better end results. Reverse osmosis and membrane filtration methods are rarely used for cosmetic nanufacture in India. These technologies have not been leveloped indigenously. Initial investment costs are high. The quipments for iodination, depth filtration and ultraviolet irraliation are locally made.

From our experience most the cost effective method of waer purification for cosmetic usage is the set up consisting of:
1. Deioniser
2. A set of depth filters
3. Ultra-violet irradiation unit.

DEAL WATER SUPPLY SET UP

Storage and distribution system of water can be a major source of microbial contamination. The entire water supply system may consist of pumps, storage bins, pipelines, metering devices etc. While installing this system it is extremely important that a microbiologist should be consulted. The system should be so designed that:

1. It should have proper drainage with minimum blends to avoid stagnant spots and dead ends where microbial proliferation can take place.
2. Fittings such as valves, joints are easily accessible for cleaning and repairs.
3. Considerable attention should be paid so that material of construction is compatible to certain sanitising agents.
4. The equipment fitted in the water supply system should be maintained at their peak operating efficiency.
5. It is responsibility of manufacturer with the co-operation of microbiologist and engineering department to establish procedures for maintaining microbial purity in storage tanks and water distribution systems.

LAYOUT OF WATER DISTRIBUTION SYSTEM

Physical layout of the water distribution system is important in a large scale cosmetic manufacturing operation. First step is to decide which type of deioniser is to be used bearing in mind quality and quantity of water required.

Suitable water purification procedures should be incorporated in the distribution system. The layout may consist of centralised or peripheral purification system. Three commonly used layouts are:

1. Deadleg distribution system
2. Ring main circulation system
3. Decentralised distribution system.

In the dead leg distribution system; water lies stagnant in pipes when it is not actually being drawn. It is suitable for small factories where distribution network is small.

In the ring main circulation system water is continuously circulated through the pipework. The water passes through deioniser, filter, UV steriliser and back to its start point again. This circulation is maintained continuously. There are no dead spots or stagnant water accumulation any where.

For larger scale plants where pure water is required, a decentralised distribution system is essential wherein each water outlet has full series of water purification set up.

SANITATION OF WATER SUPPLY EQUIPMENT

To ensure that quality of pure water is maintained, it is essential that the water supply equipment should be sanitised.

Chemical Methods

Chlorination: With chlorine compounds like hypochlorite with 200 ppm available chlorine for 10 minutes contact time is quite effective. This method is not suitable for deioniser bed and it is corrosive to stainless steel and other metals.

Iodination: 25 ppm iodine with 10 minutes contact time is quite effective.

Ozone: 10 ppm ozone for contact time of 20 minutes is quite effective.

Formalin 37% solution: Formalin at 1% concentration for 30 minute contact time is most practical for sanitisation. It is a respiratory irritant and skin sensitiser.

Quarternery compounds: 200 to 300 ppm of quarternery compounds function as effective sanitiser over wide range of pH.

Physical Methods

Heat: The equipment to be sanitised is heated to 80°C at least for 30 minutes. It has to be ascertained that temperature is attained throughout process water system.

Steam: Steam like hot water does not require rinsing or cleaning to remove residual material. Large energy output is needed to maintain high temperature throughout the system.

CONCLUSION

Water is an important raw material for cosmetics. Cosmetic products need not be sterile. But presence of chemical impurities or microbial contamination in process water for cosmetic preparation is not desirable as it has direct relationship with product deterioration. There are many water purification methods. It is essential that there should be proper design and maintenance of overall water supply system to achieve desired purity.

Evaluation of an effective non-polluting chemical treatme for industrial waters*

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ABSTRACT

Awareness of the problems caused in cooling sytems, alongwith a detailed knowledge of the origins of the problems, aid the plant authorities to solve these well in advance i.e. before production is affected.

Cooling towers are a basic need in most industries for process cooling or manufacturing. Problems in cooling towers are faced when temperatures rise and production is affected. The main problems faced are corrosion, scaling, fouling and biological growth. Different treatment programmes are available for control of effective working. For years, no serious attention was paid to the effect caused by the treatment programme on the environment, only the economics were looked at. To evaluate the feasibility of the programme both costwise and environmentwise, an evaluation laboratory is an important tool.

Open recirculating cooling water is pumped from the cooling tower basin through the system equipment which require cooling. This water absorbs heat from the systems by conduction and circulates back to the cooling tower. The absorbed heat is released back to the cooling tower by evaporation of a small portion of recirculating water. The water lost by evaporation is free of any dissolved solids. Dissolved minerals remain and concentrate in the recirculating water. Water is also lost as droplets entrained in the tower. This is known as windage loss. These water droplets are identical in composition to the recirculating water.

To minimise the risk of corrosion, deposition and fouling of a system, a portion of the recirculating water is deliberately bled off from the system. This and all other system losses are constantly replaced with fresh make up water. The whole idea is to maintain a recirculating water of consistent quality to avoid problems.

For an efficient process i.e. cooling with least amount of water consumption, the cooling water should be concentrated to a minimum safe operating quality level, consistent with minimal bleed off. Maximum number of cycles will provide saving of water cost and also economize on chemical treatment.

Open recirculating systems experience problems like c rosion, scale deposit formation on heat transfer surface a deposition of fouling matter reduces the system efficien Traditionally chromate based treatment supplemented w zinc and phosphate is employed for scale and corrosion co trol. Biological growth is controlled by chlorination. Due the awareness of environment pollution and other limitatio chromate treatment and chlorination are now-a-days bei substituted by new treatment programmes(1). Chromate bas treatments are still used in our country, though banned abroa because they are comparatively cheap, the raw materials a easily available and a good control was achieved over t operations.

A variety of new chemicals for scale corrosion inhibitio and a new range of microbiocides are on the frontier of wat treatment. Evaluation of such new products is an importa task for the manufacturer and R & D centre with a view t being cost effective and also non-polluting.

The industrial and economic importance of cooling wate treatment for the control of corrosion scale, fouling and bio logical contaminants has justified the design and use o sophisticated test loops for the development of such treat ments.

For every treatment programme there are specific chemicals and concentration ranges where it functions best and provides the intended protection. There are methods for determining conditions in a cooling system and it mainly helps to establish corrosion rates, deposit monitor and microbiological control (2,3,4).

To evaluate the feasibility of treatment programme, an evaluation laboratory is an important tool. Water treatment companies abroad have also realised the importance of evaluation laboratory e.g. Monsanto Chemical Company and Dearborn are two such giants who use these types of set up(4,5). In the R&D Centre of Ion Exchange (India) Ltd., the products are evaluated for a better performance by the following:

A. Corrosion rate meter: An instrument that measures the corrosion and pitting tendencies in a cooling system. It provides an instantaneous, direct leading of the system corrosion rate in miles per year (mpy) when its probe is inserted into the cooling water.

---

* Paper presented at the Prof. J.V. Bhat 75th Birth Anniversary Seminar on "Clean Water -- The State of the Art" for Food, Pharma and Cosmetic Industry held in Bombay on 4th March 1989.

B. Test rig: A small cooling tower unit with recirculating ater system used to measure the corrosion, scaling and icrobiological growth (Fig. 1).

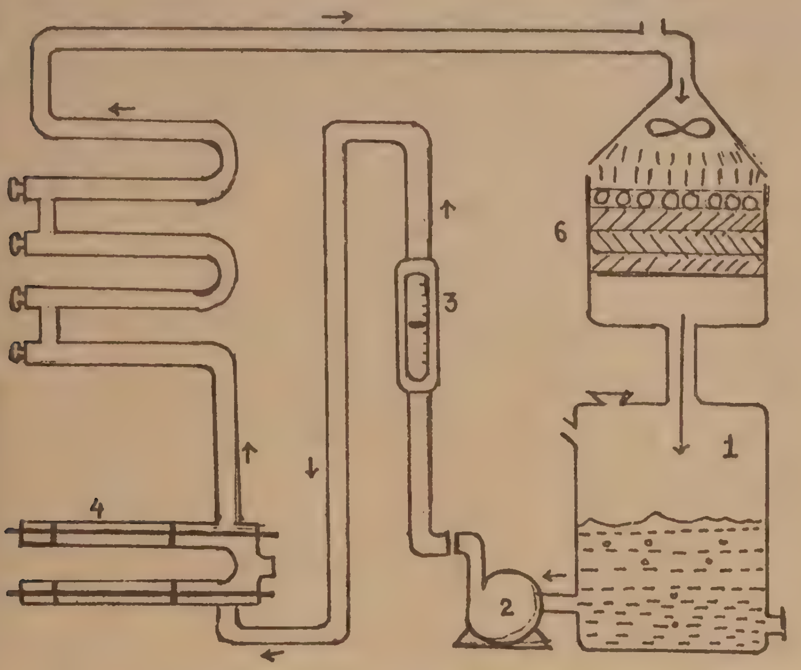

Fig. 1: Schematic diagram of Cooling Tower Test Rig.
. Basin, 2. Pump, 3. Rotameter, 4. Miniature Heat Exchanger, . Corrosion-Rack, 6. Spray pond.

The test rig mainly consists of treated reservoir/basin, pump, otameter (to measure flow rate) miniature heat exchanger, corrosion coupon rack, spray pond, evaporative condenser, tc.

C. Corrosion coupons: To establish relative corrosion ates of different metals in cooling systems, small metal strips an be used (Fig. 2). These preweighed coupons are placed in the system for some days, then removed, cleaned and weighed again. The difference in the coupon's weight, before and after exposure is used for calculating the corrosion rate.

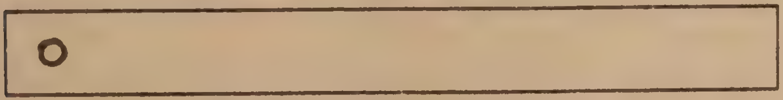

Fig.2: Corrosion Test Coupon

D. Miniature heat exchanger/deposit monitor: An aid in examining the performance of programme to scaling tendency. A sample tube of proper metallurgy is surrounded by glass jacket to form a small heat exchanger. Cooling system water flows between the sample tube and the glass jacket. The metal surface of the sample can be observed at any time during testing. Inlet and outlet water analysis will give scaling tendency of water. Heat transfer surfaces can be stimulated using a cartridge heater and cooling water flow regulated with a valve. Scale formation if any can be scraped from the surface and analysed.

Microbiological data of the water can be generated for different biocides. The evaluation laboratory is important for the following purposes:

a) Evaluation of effectivenss of different products for corrosion, scale, fouling control and microbiological study.
b) Establishment of new products.
c) Trouble shooting for field.
d) Proper and effective dosage selection of chemicals so that the programme is economically and environmentally viable.

The last decade was important for getting a major breakthrough in new products for water treatment. A lower toxicity treatment to operate at higher concentration levels without the need for rigid pH control was established.

Non-chromate treatments developed were advantageous. A few products have been developed and evaluated at our R&D Centre. The breakthroughs in non-chromate cooling water treatment is the development of the following product technologies.

A. Advanced zinc technology.
B. Extended phosphate technology.

RESULTS AND DISCUSSIONS

Advanced zinc technology

Zinc based cooling water treatments face limitations of pH (<8), risk of pitting corrosion, acid dosing and low cycles of concentrations. Due to acid addition, low cycles of concentration and large amount of make up water is required.

INDION 9015 produced through extensive research and development is a significantly improved zinc based cooling water treatment containing a unique phosphono-carboxylic acid and a polymeric dispersant which has several advantages over the traditionally used zinc/phosphate blend.

An optimised dosage of INDION 9015 acts as a cathodic inhibitor and reduces corrosion current and hence rate synergestic mixture of zinc salt and phosphono-carboxylic acid present in 9015 gives enhanced corrosion protection.

pH Performance

9015 forms a stable complex with zinc at high pH. Fig. 3 illustates the ability of phosphono-carboxylic acid to maintain zinc in solution at different pH. pH effect on corrosion of M.S. in presence of zinc based formulation is shown in Fig. 4. It appears that reduction in soluble zinc level leads to reduction in corrosion protection.

Performance with calcium

Calcium phosphate deposit formation is a normal tendency of zinc/phosphonate treatment. Overdose or a high Ca con-

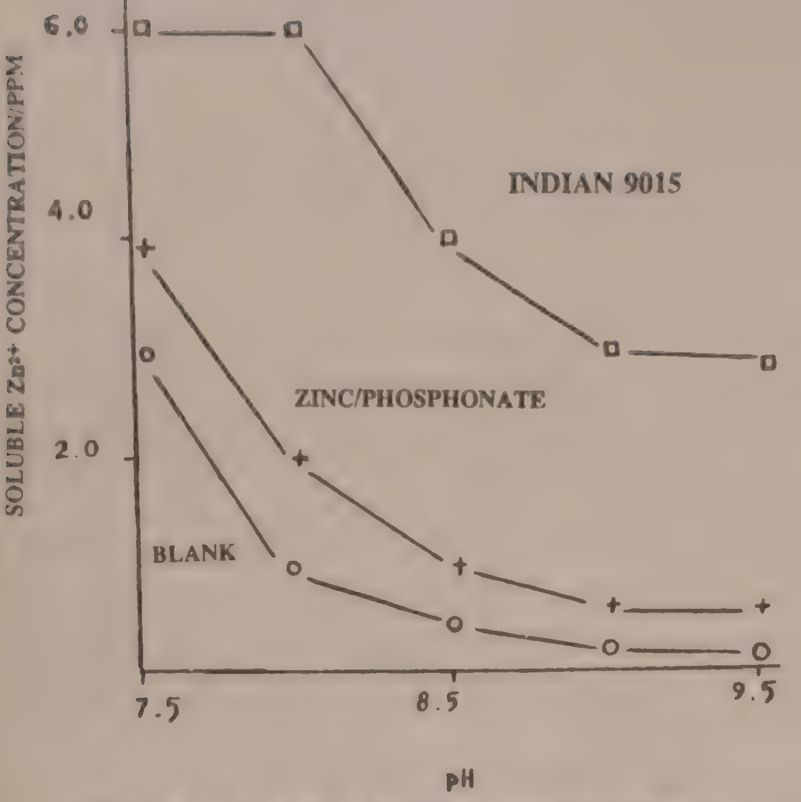

Fig. 3: Effect of pH on soluble zinc concentration

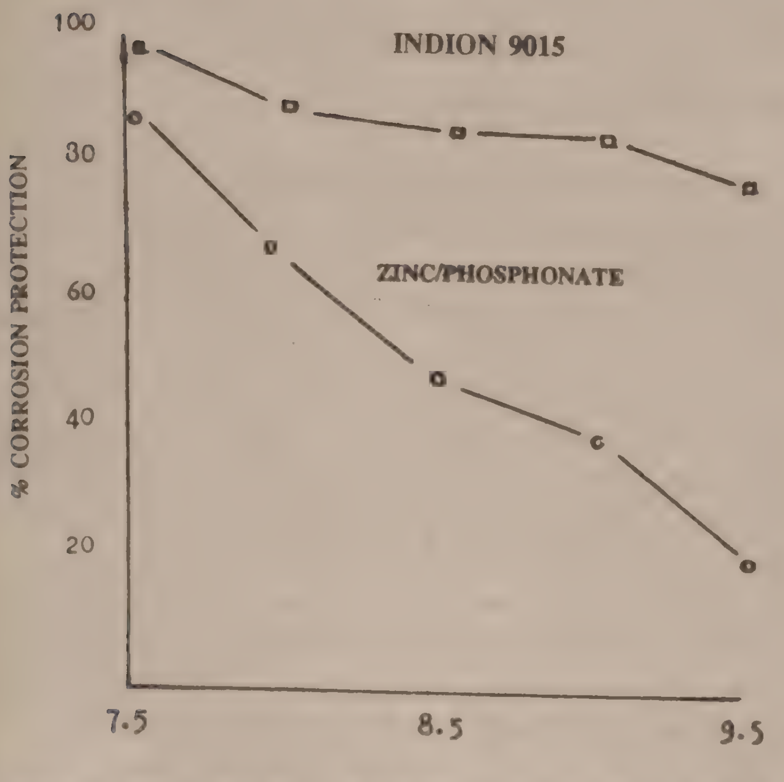

Fig. 4: Effect of pH on % corrosion protection of mild steel

tent leads to deposit formation. Phosphono-carboxylic acid does not readily form insoluble calcium salt. So, no deposit formation with INDION 9015.

Apart from the fouling of heat exchanger, reduction in corrosion protection occurs due to calcium phosphate deposition. INDION 9015 has shown good corrosion protection in high level of Ca and at also high pH. One way of representing both Ca concentration and pH of cooling water is with Langelier index. Fig. 5 represents corrosion rate of M.S. water as a function of L.I. for blank water, zinc phosphonate and INDION 9015.

INDION 9015 is a technologically advanced produc

a) It shows improved zinc solubility and corrosion inhibi at high pH.
b) It shows improved corrosion inhibition in high Ca wa
c) A wide range of different quality waters can be treated 9015.

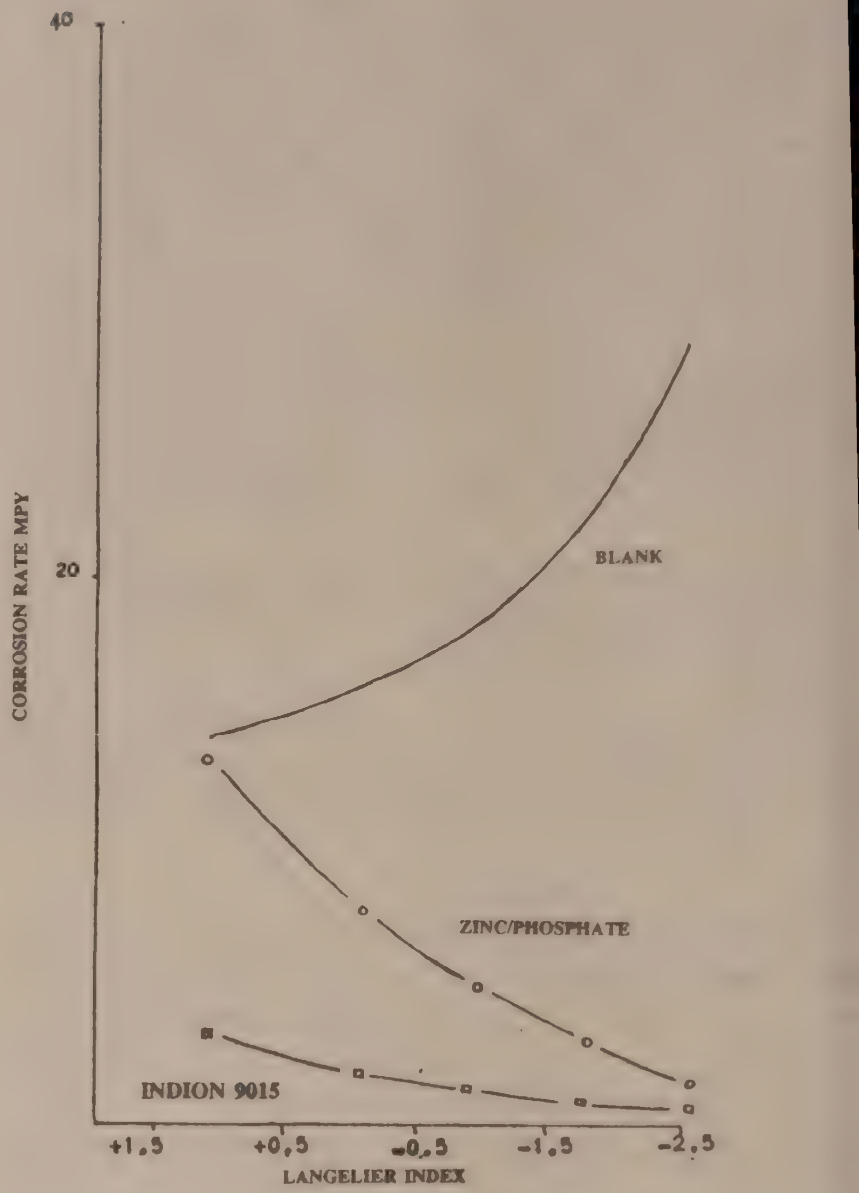

Fig. 5: Effect of Langelier index on mild steel corrosion rate

Extended phosphate technology

An effective phosphate inhibitor which utilizes the highe level of phosphate necessary for effective M.S. corrosion protection without facing the problem of Ca phosphate precipitation has been manufactured. The addition of this novel polymer controls the precipitation and allows for increased level of phosphate necessary to provide effective corrosion protection. INDION 9013 is a unique product which allows system to operate at limits of 9 to 12 ppm orthophosphate as compared to traditional 3-5 ppm.

Higher level of orthophosphate provided improved corrosion protection. This polymer controls the calcium phosphate precipitation and organophosphorous compound controls

aCO_3 precipitation. Table-1 shows an evaluation comparg extended phosphate technology with zinc chromate. It n be seen that a low toxicity product based on phosphate ith a dosage of 100 ppm at sites shows a comparable corsion rate with zinc chromate product at 35 ppm. The fact at extended phosphate technology can resist upset in inhibor dose levels and can rapidly recover from upsets in pH a major advancement in the development of low toxicity rrosion inhibitors.

Table - 1

valuation comparing extended phosphate technology with zinc chromate

ecirculating water analysis:

Conductivity	2070 umho
pH	7.5
Alk M $CaCO_3$	50.0
CaH $CaCO_3$	360.0
TH $CaCO_3$	450.00
Chloride	90.0
Sulphate	210.00

esults:

		Corrosion rate (mpy)			
dditive	**Dose**	**M.S.**	**Brass**	**M.S. heat exchanger**	**Scaling**
lank	--	42.1	0.9	48.0	3000
xtended phosphate	100	0.6	0.1	0.4	10
inc/ chromate	35	0.5	0.2	0.3	200

The trend of non-chromate treatment programme will coninue as environmental restrictions are made more strict. The various non-chromate treatment technologies offer an attractive alternative which can function over a broad range of water composition with high level of performance.

The programmes referred here are evaluated in the laboratory and currently being successfully applied in commercial cooling systems.

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Safety Cell On Fire Risk Management

V.K. AGARWAL
Indian Dyestuff Industries Ltd.,
Mafatlal Centre, Vidhan Bhavan Marg, Nariman Point, Bombay 400 021.

The recent fire (estimated loss Rs. 50 crores) in Semiconductor Complex Limited in Chandigarh occurred due to fety lapses. It could have been averted, if the security and fety measures had been tight. In the said Complex, the inilt fire fighting mechanism had not been put to test. There as no effective fire fighting drill and no contingency plan orth its name though the said Unit had a "great risk" of tching fire because of the highly inflammable materials like as, chemicals and plastics handled there.

In another recent fire in Mysore Studio also, there was no dequate fire fighting arrangement, fire & security personel, though the studios use inflammable material for sound roofing and construction and carry great risk.

Every year, fires claim atleast 15,000 lives and damage roperty worth more than Rupees 1,000 crores in the country.

Fire safety is therefore equally important as production self.

Under the auspices of the Chief Inspector of Factories, Maharashtra Govt. has created a Safety Cell, the main purpose of which is to create awareness on Fire Risk Management through Safety leaflets, documentary films, door-to-door campaigns, workshops and seminars.

Managements of Industrial Sector are convinced that the education and training to the Workers/Staff is an absolute must. The only questions which occur are

-- Who should conduct the training?
-- Who should be trained?
-- How should it be done?

One answer for the "who" and it might be the most common man, is "The Safety Officer".

This person may be termed the Fire Officer, the Safety Manager, the Safety Officer etc. The safety business may not be the full time occupation of this person. The appointment of a Safety Officer doesn't relieve the Senior Management of their overall responsibility for safety, but assists in achieving it. If there is no appointed Safety Officer, a Senior Manager has to be regarded as the person in charge of this duty.

It is very obvious that the first person who needs education and training is the Safety Officer himself. The Safety Officer must be able to appraise the fire risks within the Company and to ensure that the training given to the employees is appropriate. This means among others that the training and/or education may originate from a third person.

The Director (Safety) of Central Labour Institutes, Local Fire Brigade etc. may give proper and appropriate training. This training should include among other knowledge, the knowledge of fire prevention and of benefits of fire precautions; it has to do with the promotion of safety consciousness, with the keeping high standard of safety in a "mental" way; it incorporates to education when one teaches the employees what the hazards of flammable materials are and which sources of ignition can occur and which are the most dangerous ones, etc.

The aim of training is to develop patterns of behaviour in case of fire. It is a kind of fire drill; i.e. the use of escape routes, the methods of raising an alarm, the use of fire extinguishers etc., are summarised, so as not to waste valuable time in case of an emergency.

Education and training depend on the willingness of the management to improve hazards where practicable, and it maybe said that in successful, well managed companies this willingness is high.

In order to train effectively those to be trained must be convinced of the need for training and that this need will be fulfilled. They must see that the training is relevant to their place of work, the job that they do, and their every day experience.

The motivation for training in fire safety must be enhanced by demonstrating a Company commitment to fire safety, ensuring that all levels of staff are trained. Employees must be made aware that safety is a company objective and that planned efforts are made to improve safety standards. The educational part should be related to the hazards and protection measures in the workplace so that trainees can appreciate the relevance of the course.

Training to induce correct behaviour in event of fire depends upon the correct operation of fire protection equipment. For example, training people to close fire doors is useless if the doors are damaged and cannot be operated. Instruction that flammable liquids must be returned to a storeroom after use will only be followed if this is possible without difficulty. A high incidence of false alarms from an automatic fire alarm system will soon nullify all training in the correct response to the alarm signal. The importance of fire safety for job security and for the safety of fellow employees can be emphasised. Where suggestions for improving fire safety are adopted this may be used as an inducement to others to think positively about the fire problems in their working area.

To the question ''Who should be educated and trained?'' exists a very simple answer: everybody. There are different needs, no question, but a general education and training for fire safety is essential for all employees of a company. Any member of a staff may be the first to discover a fire, and every member of the staff must take some responsibility for working in a safe manner and for knowing how to react if an alarm is given. Every employee should atleast know to operate the nearest portable fire extinguishers.

Particular attention must be given to new employees and to those who change their place of work. A need for more advanced training will be there for instance for

-- those who supervise other staff
-- those who will have additional duties in event of fire
-- those working with hazardous materials and processes
-- those who are fire wardens or who are members of a fire action group

and one mustn't forget

-- temporary workers
-- outside contractors

both of them require appropriate training to a standard similar to that of new employees.

In setting up a training programme, the Safety Officer must consider that, although the ultimate aim is to train all staff effectively, there are some areas where the greater risks indicate a high priority for training and education.

The establishing of a training programme, involves an introductory study of the fire risks in the Company, i.e. the identification of risks, of hazards to find out the priorities of education and training. This work has always a very important side-effect: identificaation of risks and hazards is nothing else than a part of risk analysis, and as a result one will find mistakes and weak links in the chain of safety. Hence establishing a training programme is always a valuable activity for many reasons.

The training programme or in other words the needs of education and training differ from company to company, because every company has special risks, special specific realities which have to be worked out through the risk analysis, but there still remain certain basics which should be taught in any case.

Every employee should know the most important
about the nature of fire (i.e. the triangle of fire), he s
have a special teaching about the fire-danger in the sp
working area. Special knowledge would be needed regar

-- flammable liquids and their vapours
-- flammable gases
-- electricity as cause of fire
-- static electricity
-- spontaneous combustion

Every employee should be taught how and with what sp
fire and smoke can spread so as to understand the nee

-- close all doors when leaving at the end of the da
-- plug holes in walls and ceilings to avoid disastro
consequences in the event of fire

An essential prerequisite for fire prevention is adhere
to the principles of good housekeeping. It should theref
be impressed upon employees to:

-- avoid unnecessary fire hazards at their place of w
-- place waste in the containers provided
-- smoke only in those areas where it is permitted
-- place cigarette ends, etc. in the safety ashtrays
-- keep escape routes and corridors clear and doors
escape routes unlocked
-- keep fire doors closed.

Every employee should be familiar with the purpose a
basic function of the safety equipment in his/her area such

-- portable fire extinguishers
-- hose reels
-- alarm call points
-- smoke detectors
-- sprinklers
-- gas extinguishing systems
-- heat and smoke vents

and be aware that --

-- no changes must be made to them
-- evident abuses (such as the masking of fire detecto
excessively high stocking of material under sprinkler
need to be rectified immediately.

It must be emphasised that extinguishers which have bee
used (if only briefly) are to be regarded as empty and hande
in for refilling. Every employee must know how to evacua
the building in case of fire and special instructions shoul
be given on the following:

-- escape routes
-- behaviour in a smoke-filled room
-- the ban on use of lifts
-- assembly points
-- assistance for handicapped employees
-- guidance and assistance for visitors and outside contractors

-- switching off of certain equipment
-- closing all doors (not only fire doors)
-- securing important documents and large amounts of cash

The list doesn't lay claim to completeness but it gives tleast an impression where the focal points could be.

After the "who" (=everybody) and the "what" remains he question "how"?

Depending upon the subject, many different teaching and training methods can be contemplated but the principal ones are as follows:

-- Courses for large groups can only deal with general matters and the most common hazards.
-- Training for small groups and individuals are much more effective, but because they are relatively time-consuming, one uses this type of training only in those cases where the risk analysis indicates to do so.

These two statements a little bit more in detail:

A personal talk by the Safety Officer to a small group or an individual in the place of work is very efficient.

* It is specific and relevant to the work place.
* The Safety Officer and the group are a partnership, not in the relationship of teacher and pupil.
* The direct contact engenders intensive attention and good feedback in questions and suggestions.
* The Safety Officer can assess the understanding achieved and reinforce training as necessary.
* The Safety Officer is led to a better understanding of the fire risk in that area.

A talk by the Safety Officer, perhaps with others, to a medium group (30-40 people) has other merits.

* It reaches a larger number of people.
* It can still be specific to a department or part of the company if structured correctly.
* Additional instruction techniques and training aids can be used.
* The time taken for instruction is known and controlled.
* Some feed back and assessment of efficiency can be obtained by discussion, question sessions etc.

Additional methods are:

* Demonstrations, particularly of fire fighting equipment.
* Films, videos, and slides available from the Fire Protection Association.
* Lectures, from the Fire Protection Association or from the fire brigades.
* Computer Programmes.
* Poster campaigns, mainly for reinforcing training in the basic topics of fire safety.

In most companies are members of the staff who need a special training. It is impossible to describe all of them and it will be one of the duties of the Safety Officer to find out who in his company needs it.

To this category belong for example, New employees who are particularly at risk when they first start work, and at the same time put the firm at risk because

a) they have not the necessary safety consciousness specific to the business, and
b) they are at the early stages of a situation in which they are under psychological strain. The firm must therefore make every effort to remedy both of these shortcomings in the shortest possible time.

The same procedure should be chosen for employees who changed the place of work within the company.

One should never forget to give the telephonist an "incident sheet" which helps to behave correctly in the event of an alarm or an incident. This sheet should at least include:

-- internal alarm schedule
-- external alarm schedule
-- primary alarm (fire brigade, police, doctors, ambulance)
-- secondary alarm numbers (safety officer, management, works manager)
-- handling of incoming calls during an incident (press, inquisitive callers, relatives, general business calls)

The watchmen are the ideal people to discover fires, by reason of their job. It is therefore especially important that they should be particularly familiar with the alarm procedures and first aid fire extinguishing, and it goes without saying that they must be familiar with all special fire prevention installations on the works site, like sprinklers or smoke-detectors.

It is frightening to note how many fires are caused by inadequately trained welders. Particular attention should therefore be paid to the training and instruction of welders in respect of fire prevention:

-- preparation of the worksite
-- attentiveness during work
-- cleaning up the worksite
-- final check
-- ability to operate all possible extinguisher types
-- familiarity with special fire prevention precautions & alarm facilities
-- written permission to weld in the case of work in hazardous areas.

In plants where there are special hazards like explosives, highly toxic substances etc. it is the employer's duty to draw his employees' attention to these and train them to act appropriately in the event of a fire.

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ICMA releases documents on safety

The Indian Chemical Manufacturers Association has released a film on the hazards involved in transport of chemicals, as also two documents pertaining to safe transportation of hazardous chemicals, and emergency planning (see CHEMICAL WEEKLY March 28, 1989, p.43)

FILM ON "TRANSIT HAZARD AVERTED"

Indian Chemical Industry has witnessed a phenomenal expansion in the last two decades. A number of these industries have to handle chemicals which have flammable, toxic and poisonous properties and the same are required to be transported by road for long distances. This has tended to give rise to increased hazards for road accidents involving hazardous carriers.

A close analysis of the reasons for such accidents reveals that the lack of education of the drivers is the single most important factor for the unfortunate mishaps. An urgent need was, therefore, felt to educate the tank and truck drivers carrying hazardous chemicals from one part of the country to another, quite often traversing through thickly populated urban areas.

"Transit Hazard Averted" is a film resulting out of the collaborative efforts of Indian Chemical Manufacturers Association (ICMA), Loss Prevention Association of India Limited (LPA) and the Transport Commissioner, Maharashtra. This has been produced by LPA as a valuable contribution towards the objective of safer transportation of hazardous chemicals by road.

The film highlights the need for preparedness on the part of tanker or truck drivers and other vehicle crew, in safe and effective handling of road transit mishaps involving carriers of hazardous cargo, the HAZCHEM code and use of Transport Emergency Card (TREMCARD) and the emergency information panels on road tankers/trucks, precautions for loading and unloading of such vehicles, periodic medical check-ups and adoption of safe attitude while driving hazardous carriers.

The film will be found extremely useful by the chemical industry, transport community, fire brigade and various other services which are involved in the prevention and control of transit mishaps.

"CODE FOR SAFE TRANSPORTATION OF HAZARDOUS SUBSTANCES BY ROAD"

The large number of road accidents in the country is a cause for serious concern. Since some of these accidents involve vehicles carrying hazardous substances, the cause for concern is even greater due to the likelihood of fire or explosion or toxic release.

In 1987, at the request of the Transport Commissioner of the State of Maharashtra, the Indian Chemical Manufacturers Association (ICMA) convened a meeting at Bombay to consider aspects of safety involved in transportation of chemicals by road. ICMA has subsequently been regularly interacting with the Transport Commissioner's office to support measures for safe transportation of chemicals.

In order to improve the safety in transportation of hazardous substances, the Government of Maharashtra in 1986 had stipulated that vehicles carrying hazardous goods should display prominently the emergency information panel bearing the correct technical name of the substance, the U.N. hazard class label, the HAZCHEM code (Emergency action code), etc. The crew of the vehicle is required to have in their possession not onlythe transport emergency card (TREMCARD) for the specific goods being transported, but also the standing instructions in writing from the suppliers of the hazardous goods.

The current publication was undertaken by ICMA at the request of the Transport Commissioner, Maharashtra State who felt that due to absence of a reference document, the Emergency Panels and Hazchem Codes required in the State of Maharashtra for transportation of hazardous substances by road are not being followed.

ICMA has also represented to the Ministry of Surface Transport in August 1988 that measures are required to be taken on an all-India basis by all States of the country, if safety in transportation of chemicals is to improve.

This document of ICMA is a useful reference book for every company, driver training schools, transport inspectorates of every State and all others who have a responsibility and concern for ensuring safety on the road, particularly during transportation of hazardous substances.

"MODEL ON-SITE EMERGENCY MANAGEMENT PLAN"

The preservation of life and protection of the environment needs that industry should assess the risks involved in their operations and seek appropriate methods to minimise, if not eliminate them.

In spite of various risk mitigation measures taken by the industry there is a need for every industry to prepare contingency plans for dealing with incidences which may still occur and are likely to affect life and property both within the industry and in the immediate neighbourhood.

Such an emergency could be the result of a malfunction or non-observance of operating instructions, or at times, the consequence of acts outside the control of plant management like earthquakes, deliberate acts of arson or sabotage, etc.

Where the effects of an emergency can be contained within the boundaries of the factory the "On-Site Emergency Management Procedures" would be adequate to deal with the situation.

Indian Chemical Manufacturers Association (ICMA) strongly recommends that each Works should formulate an Onsite Emergency Management Plan detailing explicitly what action will be taken and by whom in the event of a major accident occurring onsite.

This action should be to contain the problem, prevent further escalation, ensure rapid control and prevent damage to life, property and environment.

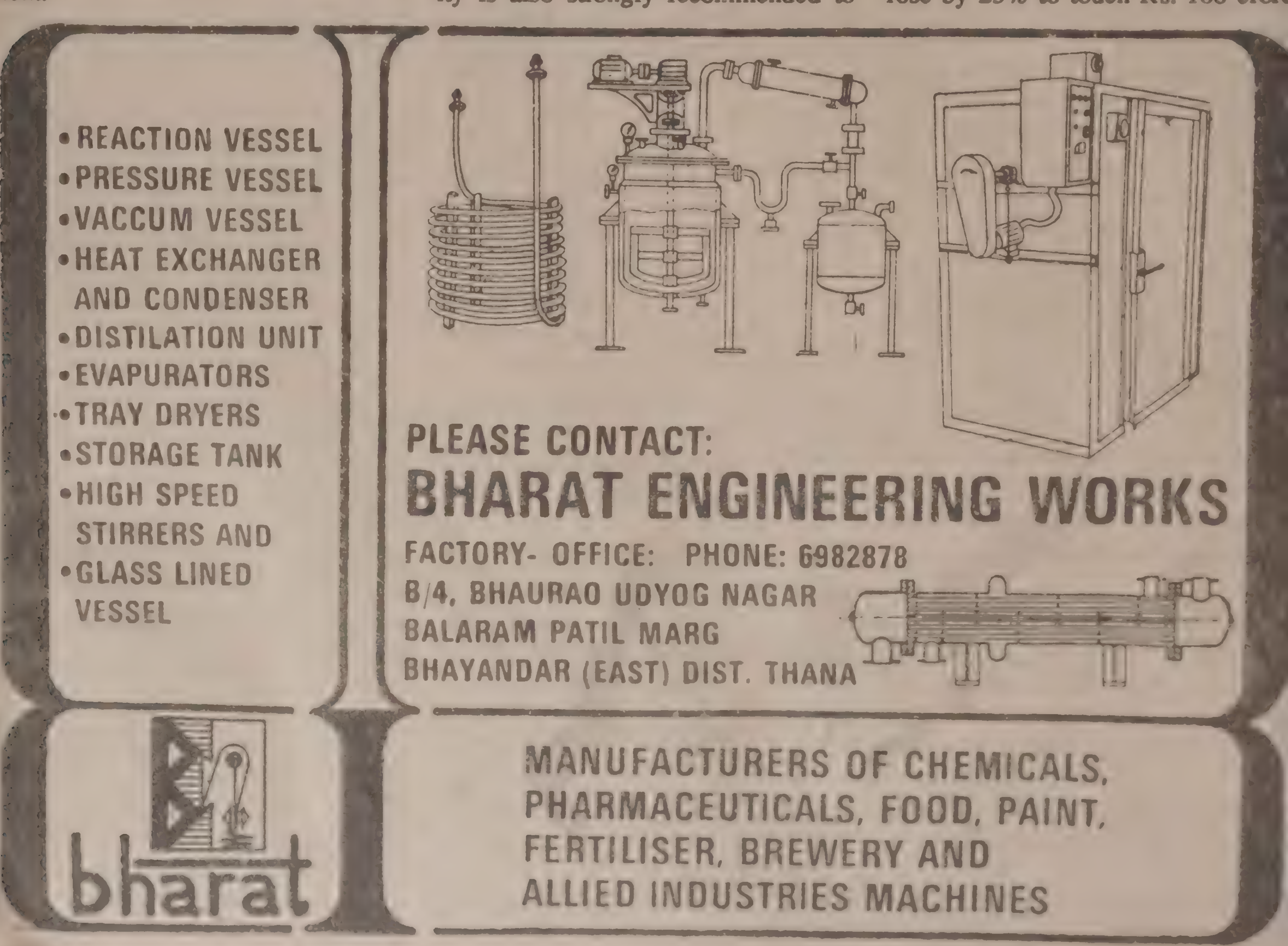
ICMA felt there was a need to provide a model document for On-site Emergency Management which is relevant to Indian conditions with limitations on communication, infrastructure and resources available to a Manager in an Indian Chemical Plant vis-a-vis his counterparts in developed countries.

The Onsite Emergency Management Plan is one of the requirements of the 1987 Amendment to the Factories Act. As chemicals in India are made by various sectors -- cottage, small, medium, large and mega plants, the model published by ICMA needs to be suitably scaled down or up depending on the scale of operations and available resources. This can be done by combining several roles and responsibilities in one individual as appropriate or have several persons and teams to carry on the responsibility depending on location and the size of the Works. Use of pre-printed instruction cards on checklists for each individual handling the role/responsibility is also strongly recommended to ensure that instructions given earlier
not missed out during execution.

The document is unique and will
found useful by the individual u
engaged in hazardous processes in p
paring their own Onsite Emergen
Plan as a part of good safety mana
ment and also for discharging their s
utory obligations.

IDPL TURNS THE CORNER

The public sector, Indian Drugs a
Pharmaceuticals Ltd. (IDPL) has at l
turned the corner. The company h
made a gross profit of Rs. 5 crores
1988-89 after making losses for fo
years. For the year, however, the co
pany may still remain in the red af
providing for depreciation and inter
charges. The company, during 1988-
has surpassed all previous records
production and sales. Production
Rs. 193 crores represents an increase
22% over the previous year. Sales al
rose by 25% to touch Rs. 168 cror



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NEWS FROM ABROAD

ARGENTINE PETROCHEMICAL PLANS COME UNDER THREAT

Argentina's Petrochemical industry is facing a major threat to its ambitious investment plans. A series of planned new projects valued at some $2.8bn could be axed if, as appears likely, the government decides to abolish its subsidies programme.

Under the current system, known as Resolution 105, the Argentinian government tops up the prices charged by refiners supplying raw materials to petrochemical producers. Product is sold at prices some 20 per cent lower than prevailing international levels.

The government's subsidy is valued at around $110m/year, but it is under pressure to divert these funds into areas such as health and education. Forthcoming general elections in the country may make this pressure difficult to ignore.

The petrochemical industry's main investment headache surrounds the pricing of raw materials. If there is no way to calculate a return on investment, plans for new plants are automatically thrown into doubt.

The problem also has to be considered by overseas chemical firms planning to invest in Argentina. The removal of resolution 105 could result in attention being focused elsewhere.

While domestic manufacturers have not completely given up hope that the government will maintain its support of the industry, local sources say the future is very uncertain. The volume of subsidies for chemical projects is thought likely to fall dramatically, if not disappear altogether. Petrochemical producers are urging the government to draw up a serious policy for the industry that will remove the climate of uncertainty and enable projects to progress.

Meanwhile, the government's far-reaching privatization programme for the sector has virtually ground to a halt since the flotation of its 39.6 per cent stake in toluene diisocyanate producer Rio Tercero failed to attract a single bid. The government is now expected to relaunch the bidding at a lower price — the company was valued at $91m — but it is not clear when this will take place.

Proposed petrochemical investments in Argentina ($m)

Company	Product	Amount
Petroquimica Bahia Blanca, Electroclor	PVC	485
	aromatics/oxoalcohols	170
General Mosconi	PP	133
Petroquimica Cuyo	gas separation	110
Dow, Perez Companc	ethylene, PE, propylene, PP	420
Dow, Perez Companc	styrene, PS, ABS, styrene	350
Pasa	acrylonitrile, ethylene, benzene	
Resinfor	methanol	22
Petroquimica Austral	methanol	230
Indupa	ammonia, DAP	280

Sources say it is possible that privatization efforts may be revived before the election. However, the situation may be further complicated by the resignation of Dr. Jose Maria Llados, the minister heading up the privatization programme. He is believed to have quit his post in order to concentrate on the general election.

For the next few months at least, it appears the future of Argentina's petrochemical industry is hanging in the balance.

REICHHOLD BOOSTS PE RESINS

Reichhold Chemicals has acquired the polyester resins business of the former Koppers Co, now owned by Beazer, for $78m. The deal reinforces Reichhold's lead as the world's largest supplier of unsaturated polyester resins and also makes it the largest US producer.

The assets involved relate to the production of fire retardent polyester, vinyl esters and resole intermediates (used in insulation boards), and complements Reichhold's existing product lines. The business, which has sales of around $120m, will be integrated into the US firm's reactive polymers division.

According to John Gaither, division president, both companies are technological leaders in unsaturated polyester and vinyl ester resins which have applications in glass-reinforced and other composites in the automotive, marine, construction, corrosion-resistant and related industries.

Reichhold will boost its overall production capacity for these products with the addition of the Koppers facilities at Bridgeville, Pennsylvania and Oxnard, California. The agreement will also enable the company to devote more resources to R&D, customer services and technical support.

This latest divestment means Beazer has sold off nearly all the chemical assets acquired under the Koppers deal. The company is still in talks to sell the remaining businessess.

DOW ACQUIRES BP POLYOLS BUSINESS

BP Chemicals has announced further steps in the rationalization of its speciality chemicals operations.

The UK firm has agreed in principle to sell its performance polyols business to Dow and is also in talks on the sale of its silicone surfactants operation to an as yet unnamed third party. Terms have not been disclosed.,

The agreement with Dow includes BP's polypropylene glycols, co-polymer polyol, polyether polyol and systems and related products. Sales are around $100m/year. The main manufacturing facility involved is BP's 45,000 ton/year plant at Antwerp in Belgium. There is another small production unit at Barry in the UK plus R&D facilities near Geneva, Switzerland.

The company is in the process of identifying speciality niche areas on which it will concentrate future resources. Some 34 per cent of BP Chemicals' £3.25bn turnover in 1988 came from speciality chemicals.

R-P DRUGS PURCHASE

France's Rhone-Poulenc h
agreed in principle to acqu
Monsanto's aspirin and parace
mol business and is looking
complete the deal within the n
few months.

The agreement includes pr
duction units for salicylic aci
methyl salicylate, acetyl salicyl
acid (aspirin) and N-acetyl para
aminophenol (paracetamol) loca
ted in the US at St Louis, Mis
souri and Luling, Louisiana, an
in the UK in Ruabon, Clwyd.

Rhone-Poulenc will also streng
then its operations in the Far Eas
with the acquisition of Monsan
to's share in a joint venture fo
the manufacture of acetyl salicy
lic acid with Osothsapha nea
Bangkok in Thailand.

Total sales of these activitie
is put at around FF500m ($81m
and would add to the French com
pany's existing analgesics busi
ness making it a world leader fo
the active ingredients.

REPSOL MMA DEALS

Spanish Chemicals group, Repsol has acquired a 70 per cent holding in Polivar, an Italian manufacturer of methyl methacrylate (MMA) products, and has secured an option to buy the balance. It has also purchased a Danish company, Rias, based at Bronderslev. The deals are said to have a combined value of around Pta5bn ($43.7m).

The two companies take Repsol's MMA activities into downstream areas and represent an important addition in the field of technology licensing deals. The Spanish firm has an MMA production unit with capacity for 35,000 ton/year at Tarragona.

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Chemical Markets Abroad

MEG SPOT PRICES SLUMP AS BLENDING SEASON FAILS

The second wave of technical grade MEG buying which usually takes place in January and February has not materialized this year. This is due to the mild weather experienced in Europe during the winter.

Technical product is traditionally bought by anti-freeze blenders to top up existing supplies Spot prices have suffered significantly from the lack of buying interest, slumping from $1,550-1,600/ton fob in the fourth quarter to $1,180-1,200/ton fob now.

Players who had speculated on a bad winter are thought to be sitting on product, as buying interest is so lacklustre. One trader commented, "the only effect of offering bulk parcels on the spot market would be to bring numbers down further." In an attempt to soften the blow of a sliding market some sellers are shifting small parcels by the truckload at 1,160-1,200/ton fob.

MEG's technical grade supplies could lengthen further as Soviet and Turkish product enters the European market. This is excluding NWE production which has already increased by BP's start-up of this 120,000 ton/year ethylene oxide plant and 110,000 ton/year glycols unit at Antwerp. The company says the plants are currently running at 80 per cent and that most material will be kept off the merchant market. However, overall glycol supplies will rise.

European traders who see little interest in the European market are said to be turning to the Far East. To compete with Saudi producers who are already supplying the region, numbers would have to drop to $1,130-1,150/ton fob. Few players have admitted to offering product at these low levels.

The weakness of the spot market contrasts strongly with the contract market. First quarter contract prices for MEG technical grade were settled at DM2,500-2,700/ton ($1,388-1,500/ton). Fibre grade material was fixed at DM 2,100-2,200/ton. Producers argue that customers who wish to guarantee supply have to complete with ethylene oxide derivatives, such as glycol ethers and polyols. Customers wishing to cultivate long term relationships will have to pay the higher numbers.

In posting contract ideas for the second quarter, producers are looking for a hike of DM100/ton on current prices. They argue that Far Eastern demand will rise due to regional downstream expansions and start-ups, which will mop up surplus in the market. World glycols demand, calculated at 6.4m ton in 1988, is set to rise by 3.5 per cent this year, meaning 230,000 ton more material will be required. With no major start-ups due, prices are expected to rise.

TiO_2 SUPPLY TO STAY TIGHT

The tight supply/demand balance for titanium dioxide (TiO_2) is predicted to persist throughout the 1990s with only some slow periods of respite, according to a study by Fallon Research Associates of the US. Prices will accelerate faster than ever before, Fallon says, sufficient to justify new capacity additions.

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Even with additions to TiO_2 capacity expected over the next few years, Fallon sees a shortfall of some 100,000 ton developing by 1993 after a surplus in the period 1990-92. New capacity has been arriving too slowly, Fallon states, particularly since additions worth a total of 180,000 ton/year announced by Du Pont in South Korea, Taiwan and Brazil have not materialized.

New plants for 1990-92 will require prices of around $1/pound to earn a 20 per cent return on investment, the consultant reckons. US prices are currently close to these level whilst European prices are already 10-25 per cent ahead. The price tag for new units in the period 1995-2000 will be $2/pound and Fallon estimates that TiO_2 prices will reach this level by the end of the century.

One significant trend will be more value added to raw materials in source countries, including Australia, China and the Soviet Union. Over 80 per cent of TiO_2 raw materials come from Australia and South Asia — SCM's new unit in Australia a Tioxide's plans for a sulpha route unit in Malaysia are inc cations of this trend.

TiO_2 supply/demand balance mton)

	1988		1993		2000	
	s	d	s	d	s	d
Free market economies	2.6	2.6	3.0	3.0	3.2	3.5
Controlled economies	0.3	0.3	0.3	0.4	0.4	0.5
Total	2.9	2.9	3.3	3.4	3.6	4.0

Source ; Fallon Research Associates

In free-market economies, cu rent consumption of Ti amounts to some $6bn/year By 1993, this figure is projecte to rise to $9bn/year assuming 5 per cent/year price increase By the end of this century, wit pricing expected to be aroun $2/pound, total consumption i free market and centrally-planne economies is projected by Fallo to top $20bn/year.

WORKERS KILLED IN AMMONIA BLAST

Two workers were killed in an explosion and fire at one of the Grand Paroisse ammonia units at Grand-Quevilly near Rouen in France. The workers were part of a maintenance team belonging to an outside company.

The incident occurred on February 23 during inspection work on a value of the ammonia synthesis circuit of the unit. The 330,000 ton/year plant, one of two operated by Grand Paroisse at Rouen has been closed pending an inquiry into the cause of the accident.

A statement issued by Grand Paroisse said that the incident was contained within the site's safety zone and there was no danger to the environment.

UNILEVER BUYS FABERGE

Unilever Group, the Anglo-Dutch company, has acquired Faberge for $1.55 billion. That move will increase the company's market share to about 9.5%, from 7.5%, and "will increase Unilever's personal products business by more than 25%," according to a company spokesman.

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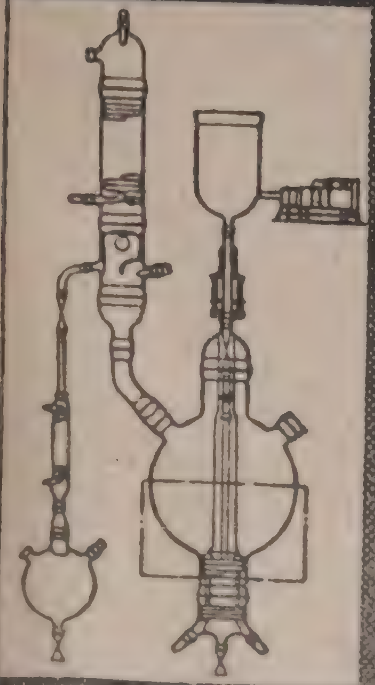

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Biotechnology

GC INOCULANTS JOINT ENTURE

Agricultural Genetics Co AGC) has formed its first overeas subsidiary with the formaon of a joint venture with Canaa's RhizoGen Corp, which prouces and markets Rhizobium inoulants.

These products contain nairally occurring bacteria which nprove the yield of legume rops by allowing them to utilize tmospheric nitrogen as opposed o fertilizer or soil nitrogen. AGC's MicroBio division will wn 51 per cent of the new unit which will be known as MicroBio RhizoGen Corp.

The venture will combine AGC's research and technical capabilities, with RhizoGen's manuacturing and marketing ability, nd will primarily target the wesern Canadian market.

SANOFI ACQUIRES

Sanofi has acquired the US veerinary company Quality Plus Essar Corp based in Fort-Dodge owa. With annual sales of $30m, the acquisition takes Sanofi's US affiliate Ceva from twelfth to fifth in the US veterinary product rankings, totalling sales of $95m.

The French firm says that Quality Plus has several synergistic businesses and good growth prospects. It adds that these will be bolstered by Sanofi's US. European, and Asian animal health and also through the production of new drugs developed by the French firm in the US.

BIOGEN WINS GERMAN INTERFERON APPROVAL

West Germany's federal health authority has approved Biogenetically engineered interferon, sold under the trade name Polyferon. Used for treating rheumatoid arthritis, the drug will be sold under licence in West Germany by Biogen's joint venture partner Dr. Rentscher Arzneimittel. The 50:50 joint venture Bioferon Biochemische Substanzen will supply the product to Rentscher.

According to Bioferon, clinical studies with the gamma interferon drug have been encouraging. Around 50 per cent of the arthritis patients given the drug showed improvement and lasting improvement was seen in 40 per cent.

Bioferon holds an exclusive patent in West Germany for gamma interferon used in arthritis treatment. In West Germany the arthritis prescription drugs market is worth more than $500m/year.

DEGUSSA PUTS FERMENTATION TECHNICAL CENTRE INTO OPERATION

At the Halle-Kunsebeck factory of its subsidiary Asta Pharma AG, Degussa AG has put a highly-advanced technical centre into operation for the study of fermentation processes. This means that Degussa, which has for some years now been concentrating its biological research at this location, can now call upon extensive facilities in the field of biotechnology. The newly built and comprehensively equipped centre, run by a process control system, enables fermentative procedures used in the manufacture of products for the foodstuffs and animal feed sector, and also for pharmaceutical purposes, to be tested and essential information obtained which is of relevance to large-scale production plants.

Degussa is currently focussing attention at its new bio-engineering centre on developing a fermentation procedure for the production of L-lysine, an essential amino acid which is important as an additive to animal nutrition. Work is also being conducted on the fermentative manufacture of the amino acids L-threonine and L-tryptophase.

BRAZIL VAM CLOSURE

Rhodia, the Brazilian subsidiary of France's Rhone-Poulenc has closed its 30,000 ton/year vinyl acetate monomer (VAM) unit at Paulina, Sao Paulo. The company has blamed the rising cost of electricity required to produce acetylene feedstock for the unit.

However, Rhodia says it has no intention of withdrawing from the manufacture of other acetyl derivatives in Brazil. The company also produces acetic acid, acetic anhydride, cellulose acetate and acetate solvents.

The Brazilian market for VAM is estimated at 60,000 ton/year. Local demand will be satisfied by Brazil's remaining producer, Alcoolquimica Nacional, a subsidiary of Coperbo which has a 80,000 ton/year plant at Cabo, Pernambuco based on ethylene.

Technological Scene Abroad

CHEMIE LINZ STARTS UP GLYOXYLIC ACID PLANT

Austraia's state owned chemical company, Chemie Linz has brought on stream a 2,500 ton/year glyoxylic acid plant based on novel ozonolysis/reduction technology developed in house. The unit costs Sch250m ($18m) to build and will be capable of making a range of speciality intermediates. The dimethylester of maleic acid feedstock for the facility is made internally.

Chemie Linz says the process has several advantages over existing routes to glyoxylic acid. To start, the company claims it is less environmentally hazardous than the conventional route based on the oxidation of glyoxal or acetaldehyde by nitric acid. The only waste product is carbon dioxide and emissions are well within environmental limits. In addition, Linz says its new process minimizes the risks associated with using ozone, which is highly explosive

Moreover, the absence of byproducts leads to higher product purity and yields. Chemie Linz claims it can achieve yields greater than 95 per cent with the process, while other routes yield around 80 per cent. The company adds that this makes the ozonolysis / reduction process highly competitive.

The world market for glyoxylic acid lies between 8,000 to 10,000 ton/year and is worth around Sch250m. Chemie Linz notes that there is strong demand from downstream markets notably the aroma chemical vanillin, which is made from glyoxylic acid. Other markets include pharmaceuticals, cosmetics and agrochemical intermediates. Chemie Linz's sister company, Agrolinz, uses the acid to make its pyridate herbicide Lentagran.

The ozonolysis/reduction technology can be used to synthesize a range of aldehydes and ketones based on different feed materials. One product already developed is the agrochemical intermediate 2-hydroxyquinoxaline.

After establishing the Austrian unit Chemie Linz is planning to move into the US market with its new process. Its options include acquiring a company, which could incorporate the technology, or by building a grassroots plant. Linz, says there is already a significant customer base for glyoxylic acid in the US, where it already has a sales office. In addition, Agrolinz has a Lentagran unit in the US. Chemie Linz is eyeing around ten potential acquisition targets and hopes to have a deal worked out within the year.

The proprietary technology will not be available for licensing.

NOVA MOVES INTO TPOS

Canada's Nova Corp is moving into the thermoplastic olefinic (TPO) elastomer sector by purchasing Advanced Global Polymers from Detroit Plastics Moulding.

The acquired firm, which has been renamed Genesis Polymers, owns a 60,000 ton/year polypropylene (PP) plant in Detroit, Michigan. The unit came on stream last Autumn and is capable of producing homopolymer PP, ethylene propylene block copolymer and thermoplastic olefinic elastomers, using technology supplied by Japan's Mitsui.

Nova's subsidiary, Polysar, supply propylene feedstock to plant via a pipeline from its nia, Ontario, Canada plant.

Nova says the acquisition fit neatly between its exis polyethylene (PE) business which include linear low, a high density PE, and its polys rene activities. The Canad firm adds that it is excited by t technology used to make therm plastics. It believes the plant the most advanced PP bas thermoplastic elastomer prod cer in North America.

The only other unit using th technology is Mitsui's in Japar A key advantage of the process that the quality of the therm plastic olefinic resins can be mo tightly controlled compared wi conventially made elastomers produced by melting and blend ing plastic with rubber. Also desired properties can be built to the elastomeric products by a tering the polymerization process.

When Nova first eyed the bus ness it was planning to buy th unit with a joint venture partne This fell through and the firn went ahead and acquired the business alone. However, it is currently negotiating for a prospective partner to take a 50 per cen stake in the facility.

DU PONT CANADA IN NEOCHEM LINK-UP

Du Pont Canada has formed a polyurethane intermediates marketing partnership with Neochem Polymers, a new company based in Quebec. The joint venture, called Du Pont Neochem, will operate a 2,000 ton/year plant in St Augustin de Desmaures, Quebec, which is due for start up this quarter. It will produce polyester polyols from adipic acid supplied y Du Pont and a prepolymer based on diphenylmethane diisocyanate.

The two products will be supplied as a complete system to customers in North America and later sold on a worldwide basis. The system produces rigid plastics for moulding, which have their main application in the automotive industry.

According to Rene Proulx, Du Pont Canada's new ventures manager, customers have been enthusiastic about the new family of polyurethanes. The company believes the product can replace more expensive resin composites.

The technology was developed by Neochem's founders George Altounian and Francois Dugal when they worked at the provincial research institute.

SHELL KOSAN BUYS LAND

Shell Kosan, wholly owned by the Royal Dutch/Shell group company, is acquiring land at Tsukuba City, Ibaraki Prefecture, to construct a laboratory to support its growing chemicals business in Japan. The company hopes to obtain the necessary approvals to allow completion by the middle of next year. The total cost of the project is Yen 2bn ($9m).

The laboratory will carry out product development and technical servicing for chemicals handled by Shell Kosan. Initially the emphasis will be on various polymers, including expandable polystyrene, crosslinked elastomers, Shell's Kraton G hydrogenated block copolymer and fine chemicals. The company says the laboratory broadens its base for expansion in Japan and adds that the next step will involve new chemicals manufacturing plant.

ICI DETAILS LCA AMMONIA PRODUCTION INNOVATION

ICI is promoting its new economic small scale ammonia manufacturing technology which it says can compete with the "giants of industry". The innovation known as leading concept ammonia (LCA) process has been incorporated into two units at ICI's Severnside site. Commissioned last year the facilities are now producing 300,000 ton/year of ammonia. Already several countries including India and China have shown interest in the benefits that can be gained from ICI's smaller scale ammonia production.

The process moves away from the complexity associated with large scale ammonia units, which with massive heat recovery and pressure systems ICI says are more akin to power plants. The design concept splits the synthesis gas and ammonia generation plant away from the utilities section.

The Severnside units are based on natural gas piped from the National Grid. The gas feed is mixed with hydrogen recycled from the ammonia process and the mix is heated and desulphurized.

The process stream is then cooled (heat is used to warm gases entering the HDS unit) before it passes into a feed gas saturator where it comes into contact with circulating hot process condensate. The feed is then mixed with more steam to give a steam to carbon ratio of 2:5 and reheated prior to reforming.

The primary reformer operates at 700-750°C and a pressure of 30-45 bar and cracks the methane, a secondary reformer fed with excess air ensures high con-

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version of methane to carbon dioxide and carbon monoxide, with hydrogen and nitrogen.

The reformed gas mixture is then passed through a heat exchanger which is used to heat gases en route to the primary reformer.

Conventional syngas plants use two furnace reformers to burn methane, this also gives large amounts of steam which can be inefficient.

By circulating the process stream from the secondary to the primary reformer the LCA process maximizes efficient heat use and eliminates harsh cracking conditions.

Following this, the carbon monoxide is converted to carbon dioxide in an isothermal water cooled low temperature shift converter operating at 250°C. Existing ammonia plants have two shift convertors — high and low temperature.

After shift conversion, the gas is cooled by direct contact with circulating process condensate and fed to a pressure swing adsorption (PSA) unit to remove excess nitrogen, carbon dioxide and inerts. This is the first time a PSA unit has been used in an ammonia plant. Other processes use wet systems for removing carbon dioxide.

The process stream is then passed on to a methanation unit prior to cooling and drying. The dried synthesis gas then enters the ammonia synthesis loop. Here gas is heated and passed over a low pressure iron-based ammonia synthesis catalyst.

The hot gases leaving the converter are cooled; the set up allows gases en route to the loop to be heated and also generates steam at 60 bar. Vapourization separates ammonia from the gas stream, and unreacted gas is returned to the converter. Argon and methane are removed from the synthesis loop by purging and recycling back to the synthesis gas generation section.

Using 7 G Cal/ton of ammonia produced, ICI says the units have a comparable energy efficiency to large scale plants.

The plants are also quick to startup. The second Severnside plant took only 19 hours to commission. ICI adds that restart from cold takes 12 hours and from hot, 4 hours. With a quicker start up, energy losses during commissioning procedures are minimized and the plant can be run to match market conditions. The company adds that fewer processing steps and milder conditions allow high reliability compared to large scale plant.

Another feature of the LCA concept is that the ammonia plant is modular this makes for easier building. While the ammonia synthesis loop is standard, associated plant such as the steam power generators and carbon dioxide recovery units can be tailor made to suit the manufacturers requirements.

ICI says its technology beats the economies of scale advantages of large units. The firm adds that where feedstocks are limited, or high transportation costs and difficulties prevail, smaller plants may be favoured.

Already the company has been courting potential customers in India and China. EID Parry which is planning an ammonia plant in Madras has already stated its terest in the technology.

ICI plans to license the tec nology through a small number contractors and hopes to ha signed agreements by shortly.

By the year 2000 the firm ant cipates having 30-40 units loc ted around the world. An ave age price tag for units similar the Severnside plants, which pr duce 450 ton/day, is put at £30 ($54m).

A SMALL STEP IN CYSTIC FIBROSIS

Cystic Fibrosis (CF) is the mos common fatal genetic disease i the U.S., notes the Stanfor University Medical Center (Stand ford, CA). About one baby i 1,600 is born with the disease CF patients, who have abnormal ly thick body secretions that plug the body's organs, generally die of respiratory failure, often by the age of 30. While the cause of the disease is unknown, studies have implicated faulty chloride channels in cell membranes. But scientists have had trouble studying those defects because they show up in cells that are difficult to maintain in a laboratory. Now Stanford researchers, led by Phyllis Gardner, assistant professor of medicine, have discovered that the defects also show up in white blood cells, which are easy to get from a patient's blood sample. Besides being simpler to study, those cells can serve as a prenatal test or as a marker to indicate who might be a CF carrier and thus at risk for bearing children with CF. Stanford also says that the existence of the defect in white blood cells may point to a link between the disease and the immune system, backing up previous evidence.

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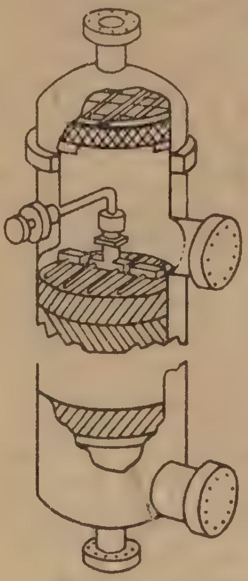

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MARKET INFORMATION

All Round Spurt in Prices

With major manufacturers creasing basic prices by Rs. 2 on ccount of increased production osts prices of a good number of yes intermediates went up.

Rumours of increase in manufac- urers' prices of J. Acid, K. Acid, gamma acid pushed up prices even further. Melamine prices shot up by Rs. 15 per kg following acute supply situation. In the solvent section rumours of refinery prices going up pushed up prices of toluene, xylene. The dyes market awaits new prices of manufacturers.

We cannot guarantee the accuracy of the prices published in CHEMICAL WEEKLY as they are based only on the enquiries made by our correspondent —and, as such they are not FIRM PRICES as between a buyer and seller. The prices are published only with a view to giving some ideas of the market conditions.

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crylamide (Resale)	75+ST
arium carbonate	6.00
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Borax (Powder)	15.25
Boric acid (Tech)	23.00
Bisphenol-A	70.00
Butyl carbitol	50.00
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Caustic soda (Solid)	8.70
Caustic soda (Lye)	6.10
Calcium chloride 70% (Solid)	3.25
Calcium chloride 75-80%(fused)	3.50
Calcium chloride 36% (Anhydrous)	5.00
Calcium carbonate (precipitated)	4.25
Calcium carbonate (Activated)	4.75
Cobalt oxide	280.00
Cresylic acid	45.00
Camphor (Indian)	102.00
Cream of Tartar (Tech.)	70.00
Citric acid (Belgium) (Resale)	48.00
Citric acid (Indian) (Resale)	49.00
Copper sulphate	26.00
Chromic acid	61.00
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When it comes to chemicals, we care a little extra. Making sure to produce chemicals that meet exacting standards of quality, purity and reliability. Backed by research and thorough testing. Our customer service can help you improve your present products and develop new ones. And remember, we can meet your requirement in bulk... whenever and wherever you want. why not try ?

We manufacture: N.T.A. • E.D.T.A. & its salt • S.M.C.A. • Sodium Acetate & Hydrochloric Acid.

We market: Acetic Acid • Acetic Anhydride • Butyl & Amyl Alcohol • Ethyl & Butyl Acetate Acetaldehyde • Paraldehyde • D.B.P. • D.E.P

ashok organic
industries ltd.

Regd Office : 406 Sharada Chambers,
33 New Marine Lines Bombay 400 020.
Phones: 252236 252256 • Telex: 011-3853
Factory: Nandesari, Dist. Baroda. Phones : 271-272

[illegible]-AD 3/78

AVAILABLE REGULARLY

TRI ETHYL AMINE
DI ETHYL AMINE
D.E.G. * M.E.G.
ACETONITRILE * CARBITOL
ETHYL CELLOSOLVE
BUTYL CELLOSOLVE
MIXED XYLENE * ORTHO XYLENE
HYDROGEN PEROXIDE 50%
GLYOXAL 40% * E.D.C.
PYRIDINE 2° * (Original)

OXALIC ACID 98% & 92%
OXALIC ACID (Substitute)
TARTARIC ACID (Substitute)
PHTHALIC ANHYDRIDE
PARA FORMALDEHYDE 91%
TRICHLORO ETHYLENE (Tech.)
METHYLENE CHLORIDE 99%
I.P.A. (Original & Distilled)
ACETONE (Original & Distilled)
THIONYL CHLORIDE

Kindly Contact:

BEEKAY ENTERPRISES

M-1 Faiz-E-Qutbi, 375, Narsinatha Street, P.O. Box No. 5212
BOMBAY-400 009.
Phone: Office: 349080/345011/322958/348475 Resi.: 5121572/5124452

Following Items Available from Ready Stock:

CALCITE
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HYDRATED LIME
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FELDSPAR
MANGANESE SULPHATE
ZINC SULPHATE
COPPER SULPHATE

FLOURSPAR
BENTONITE POWDER
RED OXIDE
LIME STONE
CHINA CLAY
DOLOMITE POWDER
TITANIUM DIOXIDE
CITRIC ACID

Enquiries will be solicited preferably in writing:
Contact:

JAI ARAVALI CORPORATION

MINES OWNER, STOCKIST & SUPPLIER OF MINERALS & CHEMICALS
29, Khadak Street, Room No. 36, 3rd Floor,
Masjid Bunder Road, Bombay 400 009.
Phone: 8722563/868009.

FOR YOUR REQUIREMENTS OF
RECOVERED SOLVENTS AS

ACETONE/IPA/MIX XYLENE/NBA
EDC (Tech. Grade) OCTANOL (170°C-180°C)
TOLUENE/BENZENE

AT VERY COMPETITIVE RATES
(We are interested in purchase of all kinds of
Chemicals/Solvents in bulk)
Please Contact:

VIPRA CHEMICALS

F/20, AMBEKAR NAGAR,
PAREL, BOMBAY-400 012.

Bombay Dyes Market

(prices as on April 11, 1989)

ACID COLOURS	Per Kg.
Acid Violet 4BS	143.00
Acid Maroon V	110.00
Acid Orange II	77.80
Acid Orange IIY	63.05
Acid Red A	107.25
Acid Scarlet 3R	99.90
Acid Red 38N	135.00
Acid Red R2R	132.00
Acid Red RS	88.00
Acid Patent Blue AS	250.00
Acid Green V	230.00
Acid Coomasi Blue	200.00
Acid Yellow 5GN	65 00
Acid Red PG	85.00
Acid Red GRS	78.00
Acid Black 10 BX	121.95
Acid Black BX	98.40
Acid Black Wax	135.50
Crosein Scarlet MOO	155.00
Procinil Yellow GS (ICI, UK)	265.00
Procinil Red GS (ICI, UK)	530.00
Procinil Blue RS (ICI, UK)	315 00
Procinil Scarlet G (ICI, UK)	600 00
Procinil Orange G (ICI, UK)	250 00
Procinil Rubine (ICI, UK)	550 00

DIRECT COLOURS	Per Kg.
Yellow 3GX	88 10
Gun Yellow RCH	124 00
Fast Yellow GCH	141 15
Yellow CFG Hly. Conc.	312 00
Fast Yellow GS	111 65
Fast Yellow CHRS	95 45
Viscose Orange A	166 15
Fast Orange GR	133 75
Red	96 90
Dark Tan	78 25
Red IIR	72 55
Red 4B	169 10
Bordeaux BW	[illegible]
Fast Scarlet 4BS	166 65
Red 12B	170 65
Bordeaux Hly. Co[illegible]	184 90
[illegible] Red R	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
Blue 2B	86.60
Blue G	170.50
Sky Blue FB	188.25
Copper Blue GR	147.00
Fast Greenish Blue GL	114.60
Developed Black BT	116.10
Blue NB-2B	300.20
Blue NB-2BC	185.30
Developed Black NB-GHB	185.30
Green B	111.65
Green NB-B	188.25
Green 2B-N	188.25
Brown MR	154.40
Brown CN	107.25
Golden Brown G	140.35
Catechin G	120.50
Omega Tan	126.40
Catechin GS	102.80
Black E Hly Conc.	142.60
Black E Extra Hly. Conc.	142.60
Black NB-ER Hly. Conc.	310.50

DISPERSOL COLOURS	Per Kg.
Yellow 6G Powder	143 80
Red B 3B Powder	247.80
Red B 2B Powder	323.20
Red CB Powder	439.15
Red D2B Powder	477.40
Violet C 4R	521.90
Blue BG Powder	235 45
Blue BN Powder	103 75
Blue D 2R Powder	476 25
Navy BT Powder	243.90
Blue B 2G Powder	210 20
Blue BT Powder	182 60
Blue BR Powder	390 20
Yellow 7GL	338 60
Yellow 5RX	218 80
Yellow 3G	367 25
Yellow	140 00
Yellow AL	135 30
Yellow Brown REL	247 50
Yellow FFL	463 60
Gold Yellow GG	259 70
[illegible] REL	247 00
[illegible] REL	468 [illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible] Violet REL	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
Violet 6R	485 75
Scarlet RR	214 80
Rubine 3B	223 00
Rubine CB	364 90
Blue GL	318 90
Blue BGF	636 50
Navy Blue RF	270.40
Brown 3REL	200 40
Black GEL	324.20
Dark Brown 3B	317 40

BASE COLOURS	Per Kg.
Fast Yellow GC	80 20
Fast Orange GC	135 45
Fast Scarlet R	166.90
Fast Scarlet RC	126.65
Fast Scarlet RCR	99 05
Fast Scarlet G	121 65
Fast Scarlet GN	91 50
Fast Scarlet GG	72 70
Fast Scarlet GGS	72 75
Fast Red B	203 20
Fast Red RC	119 15
Fast Red R Flakes	149 25
Fast Red TR	166 80
Fast Red TR Oil	183 15
Fast Red RL.	237 10
Fast Red KB Oil	201 90
Fast Bordeaux GP	201 95
Fast Garnet GBC	94 00
Fast Violet B	505 60
Fast Blue BB	521 40

NAPHTHOL COLOURS	Per Kg.
ASG	217 00
AS	143 00
ASSW	279 75
ABBS	189 15
ASBO	195 65
ASD	175 50
ASOL	[illegible]
ASTR	279 75
A[illegible]	279 75
A[illegible]	[illegible]
A[illegible]	[illegible]
A[illegible]	[illegible]
A[illegible]	[illegible]
A[illegible]	[illegible]
A[illegible]	[illegible]
A[illegible]	[illegible]

PROCION COLOURS	Per Kg.
Golden Yellow HR	181.80
Brill. Yellow H4G	117.85
Supra Yellow H-8GP	168.55
Brill. Yellow HE6G	166.95
Yellow G-E4R	276.05
Brill. Yellow H7G	332.30
Yellow M4R	243.95
Yellow M GR	326.05
Brill. Yellow M4G	177.10
Brill. Yellow M8G	332.30
Yellow M 3R	217.60
Brill. Orange H 2R	241.85
Brill. Red H 7B	157.95
Brill. Orange M 2R	313.15
Brill. Red H 8B	169.45
Brill. Scarlet H RN	245.05
Supra Red H-3BP	179.80
Brill. Red H-F3B	243.45
Brill. Magenta HB	167.00
Brill. Red M 5B	98.90
Brill. Red M 8B	173.70
Brill. Pink MB	137.10
Brill. Magenta MB	121.55
Brill. Purple H-3R	180.20
Brill. Purple H-7R	175.40
Navy Blue H 3R	298.50
Brill. Blue H-GR	366.55
Brill. Blue H 5G	173.10
Blue H 5R	283.85
Brill. Blue H 7G	178.70
Brill. Blue H 7RX	358.15
Turquoise HA	234.45
Supra Blue H-3RP	335.70
Supra Turquoise H 2G P	181.50
Blue H-FRD	305.80
Navy Blue H ER	258.60
Blue H 5RX	269.30
Navy Blue M 3R	310.95
Brill. Blue MR	331.70
Brill. Blue M RX	214.20
Brill. Blue M-G	382.30
Blue M 4GD	344.60
Navy Blue M RB	318.75
Turquoise M-G	197.85
Brill. Blue M GX	302.50
Blue 3R Acra Powder	718.20
Dark Brown H 6R	248.45
Cobalt Oxide	285.00
Green H 4BD	269.80
Green H-E4BI	169.80
Red Brown H IF	143.25
Orange Brown H 28	209.05
Brown M GRN	188.80
Black H-N	283.35

SULPHUR COLOURS	Per Kg.
Navy Blue	99.85
Green G	198.55
Black Grains Extra	63.05
Black Grains OG	64.55
Black GXE Conc.	61.60
Black GXE	52.75
Black GXR	61.60
Black Grains 800	54.20
Black EXR Grains	64.55
Black EXR Grains 800	51.25

VAT COLOURS (ICI)	Per Kg.
Yellow 5G Powder Fine	673.15
Yellow 5G Supra Disperse	439.30
Yellow 5G Acra Con.	628.75
Yellow 3R Powder	588.85
Gold Orange 3G Pdr. Fine	952.15
Brill. Orange 6R Pdr. Fine	624.35
Gold Orange 3G Supra Disp.	601.30
Brill. Orange 6RX Powder	394.30
Brill. Red 3B Pdr. Fine	997.80
Brill. Red 3B Supra Disp.	713.20
Brill. Purple 4R Conc. Pdr.	470.75
Brill. Purple 3R Acra Powder	690.85
Brill. Purple 2R Hly. Conc.	597.90
Brill. Purple 4R Supra Disp.	500.05
Brill. Purple 2R Acra Conc.	625.95
Blue R Pdr. Fine	542.15
Blue BC Acra Conc. Pdr. Fine	762.70
Blue BC Conc. Pdr. Fine	522.50
Blue R Conc. Pdr. Fine	577.65
Blue Conc. Powder	645.80
Brill. Blue 2R Hly. Conc.	378.55
Blue RR Supra Powder	629.35
Brill. Blue 2R Supra Disp.	115.65
Dark Blue 2R Powder Fine	389.25
Blue BC Supra Disp.	359.40
Jade Green XBN Powder Fine	438.20
Jade Green XBN Acra Conc. Pdr.	823.90
Jade Green 2G Pdr. Fine	419.65
Jade Green 2G Ptg. Paste	125.40
Jade Green XBN Ptg. Paste	126.00
Jade Green 2G Supra Disp.	496.00
Olive Green B Pdr. Fine	399.90
Olive D Pdr. Fine	444.30
Olive Green B Supra Disp.	308.20
Jade Green XBN Supra Disp. (N)	327.30
Olive OMW Pdr. Fine	698.55
Olive OMW Supra Disp.	538.05
Olive R. Pdr. Fine	422.96
Olive D Supra Disp.	361.70
Olive R Supra Disp.	363.90
Olive D Ptg. Paste	193.00
Olive Green B Ptg. Paste	199.10
Olive Green B Acra Conc.	542.75
Olive R Acra Conc.	640.00
Olive Green B Acra Conc.	542.75
Brown R Pdr. Fine	747.38
Brown G Pdr. Fine	795.00
Dark Brown 3R Fine	685.00
Brown G Supra Disp.	449.90
Brown 2G Supra Disp.	554.00
Brown R Supra Disp.	422.95
Brown BR Powder	719.00
Dark Brown 3R Ptg. Paste	217.15
Dark Brown 3R Supra Disp.	414.55
Brown G Acra Conc.	733.95
Brown M. Powder Fine	768.80
Grey M. Supra Disp.	585.45
Blue BC Acra Conc. Pdr. Fine	762.70
Direct Black AC Supra Disp	330.35
Direct Black AC Pdr. Fine	474.70
Direct Black CH Supra Disp.	393.20
Direct ACD Ptg. Paste	217.15

Delhi Market

DELHI: APRIL 7, (NNS) Potassium permanganate and Trisodium phosphate jumped up by Rs. 50/100 per 50 kg in the Delhi chemicals market during last week, owing to reduced supply and hike in their prices by manufacturers reports NNS. Soda bicarb, soda ash and phosphoric looked up by Rs. 5/35 whereas citric acid and tartaric acid and mercury declined by Rs. 25/50 for want of support.

Trisodium phosphate (Indian) spurted sharply from Rs. 450 to Rs. 550 per 50 kg due to poor supply against good consumption as well as hike in its prices by manufacturers. Potassium permanganate hardened by Rs. 50 at Rs. 3,350 in the absence of supply. Crystal quality potassium permanganate was quoted at Rs. 3,600 per 50 kg.

Phosphoric acid registered a rise of Rs. 35 at Rs. 935 per 50 kg in the wake of hike in its prices by manufacturers by Rs. 60/65 per 50 kg. Zinc oxide recorded a sudden spurt of Rs. 1,000 at Rs. 40,000/45,000 per tonne on poor supply and upward revision in prices by manufacturers. Carbon Tetrachloride moved up by 25 paise at Rs. 21.75 per kg.

On rumours of higher prices quoted by manufacturers and fall in supply, soda ash advanced by Rs. 10/20 at Rs. 330/345 per 75 kg. Soda bicarb Tata moved up by Rs. 5 at Rs. 280 and soda bicarb (NAL) remained static at Rs. 295. Ammonia bicarb looked up by Rs. 7 at Rs. 140 per 25 kg on good demand by bakeries. Stable bleaching powder KCI Modi and Shriram hardened by Rs. 5/6 at Rs. 91, Rs. 98 and Rs. 100 per kg. Foreseeing enhanced prices by manufacturers in the near future consequent stocking tendency was higher.

Chatkolite flared up by Rs. 2.50 at Rs. 57 on shortage of goods while rangolite Germany eased by Re. 1 at Rs. 69 on slack demand by gur khandsari manufacturers. Paraffin wax moved up by Rs. 30 at Rs. 710 on poor supply from Assam. Formic acid looked up by Re. 1 at Rs. 25.50 on poor arrivals and tight stock position. Citric acid eased by Rs. 25 at Rs. 2,300/2,550 and tartaric acid drifted lower by Rs. 50 at Rs. 7,250 owing to increased inflow of imports from China and France. Mercury slipped by Rs. 50 at Rs. 12,250 owing to increased offerings by actual users' quota. Caustic soda flakes flared up by Rs. 13/15 at Rs. 480/485 due to shortage of goods; later owing to good supply by Modi, NAL, Thapar and Gwalior it reacted downwards at Rs. 470/475 at the weekend. Menthol flake and bold moved up by Rs. 10 in the absence of fresh inflow from U.P. Menthol medium also hardened by Rs. 15 per kg. Titanium dioxide eased by Rs. 10 at Rs. 75.

(DELHI MARKET RATES AS ON APRIL 7, 1989)

Ammonia Bicarb (Per 25 Kg.)	140.00
Mercury (Per flask)	12,250.00
Soda ash (Per bag)	330/345.00
Ammonium Chloride (50 Kg.)	110/180.00
Caustic soda flakes (50 Kg.)	470/475.00
Citric acid (Per 50 Kg.)	2,300/2550.00
Stable Bleaching Powder Shriram (Per 25 Kg.)	100.00
Stable Bleaching Powder KCI Per 25 Kg.)	95.00
Stable Bleaching Powder [illegible] (Per 25 Kg.)	90.00
Stable Bleaching Powder Modi (Per 25 Kg.)	98.00
Sodium Bicarbonate (50 Kg.)	280/295.00
Sodium Hydrosulphite (Per Kg.)	35.50/40.00
Rangolite (Per Kg.)	57.00/69.00
Boric acid Technical (Per 50 Kg.)	1,175.00
Paraffin Wax (Per 50 Kg.)	710.00
Tartaric Acid (Per 50 Kg.)	7,250.00
Borax Granular (Per 50 Kg.)	670.00
Borax Crystal (Per 50 Kg.)	670.00
Sodium Nitrite (Per 50 Kg.)	660/750.00
Sodium Nitrate (Per 50 Kg.)	415.00
Camphor Thal (Per Kg.)	125
Camphor Powder (Per Kg.)	115
Menthol Bold (Per Kg.)	290
Menthol Medium (Per Kg.)	275
Menthol Flake (Per Kg.)	245
Glycerine (Per Kg.)	48/50
Sodium Silicate (Per quintal)	250/300.
Hexamine (Per Kg.)	34.
Acetic Acid Glacial (Per Kg.)	16.
Copper Sulphate (Per quintal)	2,400/2,6
Formic Acid (Per Kg.)	25.
Formaldehyde (Per Kg.)	8.
Hydrogen Peroxide (Per Kg.)	27.75/28.
Calcium Carbonate (Per Tonne)	2,500/4,00
Acid Slurry Soft (Per Kg.)	24.
Acid Slurry Hard (Per Kg.)	32.
Phosphoric Acid (Per 50 Kg.)	935.
Potassium Nitrate (Per quintal)	900/1,200.
Potassium Permanganate (Per 50 Kg.)	3,350.
Sodium Bichromate (Per 50 Kg.)	1,600/1,625.
Trisodium Phosphate (50 Kg.)	550.
Titanium Dioxide Anatase (Per Kg.)	75.
Titanium Dioxide RC-822 (Per Kg.)	80.
Zinc Oxide (Per metric tonne)	40,000/45,000.0
Phenol Carbolic Acid (Per Kg.)	37.0
Carbon Tetrachloride (Per Kg.)	21.75
Chloroform (Per Kg.)	28.00
Sodium Sulphate (Per metric tonne)	3,200/3,500.00
Naphthalene Balls (Per 50 Kg.)	1,450.00

DYES & COLOURS	(Per Kg.)
Naphthol AS	162.00
Naphthol ASG	252.00
Naphthol ASBS	215.00
Naphthol ASTR	325.00
Naphthol ASOL	208.00
Naphthol ASBO	225.00

DIRECT DYES	(Per Kg.)
Black E. Conc.	110/160.00
Diazo Black B.T.	105/135.00
Green B	100/127.00
Blue 2-B	60/92.00
Sky Blue FB	213.00
Basic Auramine	55/110.00
Basic Rhodamine	250/400.00
Basic Methylene Blue	92/130.00
Basic Violet	142/160.00
Basic Malachite Green	140/165.00
Acid Orange	45/88.00

Madras Market

Markets were quiet this week. MTC has announced steep crease in prices of lead, tin etc and e exact impact on the prices of ese metallic salts is awaited. In the ternational scene, prices are drop-ng slowly. Particularly prices of solvents like methanol, MEK have come down appreciably. Locally, there was heavy demand for isopropanol on account of insufficient production and the demand from pharmaceutical units going up sharply.

(MADRAS MARKET RATES AS ON APRIL 8, 1989)

Acetic Acid Glacial (per kg)	18.50
Aluminium Sulphate Iron free (per MT)	3,000.00
Ammonium Bicarbonate (per 25 kgs)	125.00
Ammonium Chloride (per MT)	3,000.00
Acid Slurry (per kg)	28.00
Barium Carbonate (per kg)	6.00
Barium Chloride (per kg)	5.50
Boric Acid Technical (per kg)	24.00
Bleaching Powder (per 50 kgs)	215.00
Borax (per 50 kgs)	650.00
Caustic Soda Flakes -- Mettur Chemicals (per MT)	9,300.00
Caustic Soda Flakes -- Andhra Sugars (per MT)	9,300.00
Calcium Chloride 70% Solid (per MT)	2,750.00
Calcium Chloride Anhydrous (per MT)	5,750.00
Calcium Carbonate (Activated) (per MT)	5,750.00
Calcium Carbonate (Precipitated) (per MT)	4,750.00
Citric Acid (per kg)	46.00
Copper Sulphate (per kg)	21.00
Cresylic Acid 98-99% (per kg)	110.00+ED
Pure Para Cresol 96% (per kg)	83.00+ED
Meta Para Cresol 42% (per kg)	47.00+ED
Formic Acid (per kg)	27.00
Formaldehyde (per kg)	8.00
Glue Flakes (per kg)	15.00
Glycerine (per kg)	45.00
Hydrosulphite of Soda (TCPL) (per kg)	37.00
Hydrosulphite of Soda (IDI) (per kg)	42.00
Hydrosulphite of Soda (BASF) (per kg)	42.00
Hexamine (per kg)	30.00
Hyflo Supercell (per kg)	24.00
Hydrogen Peroxide (per kg)	29.00
Litharge (per kg)	40.00
Lead Acetate (per kg)	42.00
Magnesium Carbonate (per kg)	19.00
Magnesium Chloride (per kg)	3.00
Maleic Anhydride (per kg)	48.00
Menthol Crystals (per kg)	345.00
Oxalic Acid (per kg)	24.00
Paraffin Wax (per kg)	15.00
Potassium Bichromate (per kg)	36.00
Phosphoric Acid (per kg)	20.00
Polyvinyl Alcohol powder (per kg)	140.00
Pentaerythritol (per kg)	52.00
Phthalic Anhydride (per kg)	40.00
Soda Ash (TAC) (per 75 kgs)	375.00
Soda Ash (TATA) (per 75 kgs)	375.00
Sodium Bicarbonate (TATA) (per 50 kgs)	370.00
Sodium Silicate (per MT)	5,000.00
Sodium Bichromate (per kg)	26.00
Sodium Nitrate (per kg)	8.00
Sodium Nitrite (per kg)	15.00
Sodium Sulphide Flakes (per kg)	13.00
Sodium Bisulphite (per kg)	4.00
Sodium Alginate (per kg)	145.00
Sodium Acetate (per kg)	6.50
Sodium Sulphate (Anhydrous) (per kg)	3.00
Titanium Dioxide (Anatase) (per kg)	68.00
Titanium Dioxide (Rutile) (per kg)	96.00
Trisodium Phosphate (per kg)	7.00
Urea (Technical) (per kg)	3.00
Zinc Oxide (per kg)	35.00
Zinc Chloride Powder (per kg)	12.00
Zinc Sulphate (per kg)	5.50

SOLVENTS

Acetone -- HOCL (per kg)	18.75
Butanol (per kg)	35.00
Butyl Acetate (per kg)	44.00
Benzene (per lit)	16.00
Cellosolve (per kg)	50.00
Carbon Tetra Chloride (per kg)	18.50
Chloroform (per kg)	26.00
Diacetone Alcohol (per kg)	29.50
Diethylene Glycol (per kg)	44.00
Dichloroethane (per kg)	17.00
Di-octyl Phthalate (per kg)	48.00
Di-N-butyl Phthalate (per kg)	48.00
Ethyl Acetate (per kg)	24.00
Isopropyl Alcohol (per kg)	27.50
Methanol (per kg)	10.00
Methylene Chloride (per kg)	25.00
Methyl Ethyl Ketone (per kg)	48.00
Methyl Isobutyl Ketone (per kg)	38.50
Phenol (per kg)	34.00
Sorbitol (per kg)	15.00
Triethanolamine (per kg)	60.00
Trichloroethylene (per kg)	24.00
1-1-1 Trichloroethane (per kg)	28.00
Turpentine (per lit)	17.00
Toluene (per lit)	18.00
Xylene (per lit)	18.00

International Bulk Chemical Prices

Spot prices are as on March 15, 1989

With crude prices moving up to highest levels in the past 15 months, naphtha shot up to $172-175 ton cif.

Ethylene prices remained same with no spot availability. Propylene and butadiene remained stable. Benzene slumped to $445-455/ton following fears of a weakening market in the light of anticipated styrene shutdowns. Toluene went up marginally to $350-355/ton following strong demand. Paraxylene and orthoxylene came d marginally with weakening dema

Xylene and styrene remained st Methanol prices firmed up very slig to $152-155/ton cif.

Product	European Spot price range $/ton	US price range $/ton
Ethylene	875- 900 (cif)	738- 749
Propylene (100% basis)	630- 650 (cif)	440- 505
Butadiene	260- 280 (fob)	374- 418 (spot)
Benzene	445- 455 (fob)	450- 453 (spot)
Toluene	350- 355 (fob)	343- 346 (spot)
Xylenes (virgin)	475- 480 (fob)	448- 471 (spot)
(solvent)	470- 475 (fob)	n.a.
Styrene	1100-1110 (T2) (fob)	1024-1035 (spot)
	1020-1030 (T1) (cif)	
Paraxylene	795- 805 (fob)	n.a.
Orthoxylene	485- 495 (fob)	n.a.
Ammonia	168- 170 (c&f)	142- 150 (fob)
Methanol	170- 172 (T2) (fob)	154- 156 (fob)
	151- 155 (T1) (cif)	
Naphtha	172- 175 (cif)	n.a.

Shipping News

VESSELS DUE IN BOMBAY FOR EXPORT LOADING

Due Date (1)	Steamer's Name & Flag (2)	Agents (3)	Will load for (4)	Approx. sailing dt (5)
22/4	Orient Triumph (Voy-307)	Transworld/ O.S.A.	Los Angeles; Longbeach; Sanfrancisco; Oakland; Seattle; Vancouver; New York; Boston; Toronto; Montreal; Philadelphia; Norfolk; Baltimore; Charleston; Savannah; Jacksonville; Miami; New Orleans; Houston. (Carting at M-178/180 Cotton Depot for both)	26/4
15/4	Lhotse (Voy-017)	Marine Trans/	Boston; New York; Baltimore; Norfolk; Charleston; Port Everglades; Jacksonville; Galveston; Houston; Los Angeles; Toronto; Montreal; Philadelphia; Savannah; New Orleans (Carting at T.P. No. 3)	19/4
		M.C.S.	Savannah; New York; Baltimore; Wilmington; Houston; Galveston; Los Angeles; Longbeach; Boston; Norfolk; Charleston; Jacksonville; Miami; Tempa; New Orleans; Providence; San Diego; Oakland; Sanfrancisco; Stockton; Chicago; Detroit; Cleveland; Milwaukee; Columbus; Kansas City; Atlanta; Nashville; Dallas; Minneapolis. (Carting at 7-W/H-PD)	
16/4	Vega (Voy-01)	O.S.A.	New York; Baltimore; Philadelphia; Houston; Boston; Chicago; Dallas Atlanta; Savannah; Norfolk; Charleston; Los Angeles; Sanfrancisco; Oakland; Seattle; Vancouver; Toronto; Montreal; Portland, Tacoma, and S. American and W. Indies Pors. (Carting at M-178/180, Cotton Depot)	[illegible]
[illegible]	Kapitan Kud	Marathon	Boston; New York; Baltimore; Norfolk. (Carting at T.P. No. 3)	[illegible]
[illegible]	Robert E Lee (Am)	Samarth	Philadelphia; Baltimore; Norfolk; New Orleans; Houston, Savannah, New York. (Carting at P/Q-PD).	[illegible]
[illegible]	Navigare (V-702) [illegible]	Oceanic	New York; Baltimore; Philadelphia; Chicago; Boston; Norfolk; Atlanta, Charleston, Savannah; Miami; Houston and other inland [illegible] in U.S. E. Coast and S. American ports.	[illegible]

(2)	(3)	(4)	(5)
Nedlloyd Everest	Patvolk/T.Tea S.W.&Co./ Trident	South American ports	4/5
		New York; Norfolk; Savannah; Baltimore; Boston; Charleston; Houston	
Lhotse (Voy-017) (Pan)	Marine Trans	Antwerp; Rotterdam; Hamburg; Bremen; Le Havre; Felixstowe; Hull; Rostock; London; Liverpool; Avonmouth; Copenhagen; Gothenburg; Aarhus; Oslo; Stockholm; Helsinki; Malmao; Norkpping; Helsinburg (including inland destinations for above ports); Lattakia; Limmassol; Izmir; Mersin; Istanbul; Baghdad; Marseilles; P. Said; Casablanca; Alexandria; Piraeus; Soloniki; Iraqi ports. (Carting at T.P. No. 3)	19/4
	Khemka	Larnaca; Antwerp; Rotterdam; Hamburg; Bremen; Gdansk; Le Havre; Copenhagen; Gothenburg; Aarhus; Oslo; Stockholm; Malmao; Helsinburg; Helsinki; Kopka; Rostock. (Carting at W. Bunder No. 3)	
	M.C.S.	Jeddah; Genoa; Felixstowe; Hamburg; Rotterdam; Antwerp; Le Havre; Lisbon; Aarhus; Copenhagen; Gothenburg; Oslo. (Carting 7-W/H-PD)	
Drvar (Yug)	Oceanic	Jeddah; P. Said; Rijeka	25/4
Oyster Bay	Tata Tea	Assab; Djibouti; P. Sudan. (Carting at Timber Pond No. 4).	24/4
Kapitan Kud (Rus)	Transocean/	Tilbury; Avonmouth; Liverpool; Manchester; London; Felixstowe; Birmingham; Antwerp; Rotterdam; Hamburg; Bremen; Copenhagen; Gothenburg; Oslo; Stockholm; Malmao; Leeds. (Carting at Timber Pond No. 3)	24/4
	I.S.S. Co.	Felixstowe; Tilbury; Antwerp; Rotterdam; Hamburg; Bremerhaven and Scandinavian ports via Hamburg. (Carting at Wadi Bunder No. 3).	
Orient Triumph (Voy-307)	Transworld	Djibouti; Hodeidah; Alexandria; Benghazi; Tripoli; Malta; La Spezia; Mersin; Naples; Limassol; Piraeus; Genoa; Leghorn; Fos; Valencia; and all inland destinations; Jeddah; P. Sudan; Assab; Massawa. (Carting at M-178/180 Cotton Depot)	26/4
Robert E Lee	Samarth	Assab. (Carting at P/Q-PD)	24/4
Nedlloyd Everest	Patvolk/ S.W. & Co./ Trident/ Tata Tea/	Tilbury; London; Felixstowe; Avonmouth; Manchester; Liverpool; Glasgow; Leeds; Birmingham; Dublin; Belfast; Bristol; Marseilles; Genoa; Barcelona; Le Havre; Antwerp; Rotterdam; Hamburg; Bremerhaven; Copenhagen; Oslo; Helsinki; Malmao; Gothenburg; Stockholm; Aarhus; Alborg.	4/5
	Tata Tea	Also via Rotterdam to Greece; Cyprus; Syria; Tunis; Portugal.	
Oyster Bay (Voy-4040)	Tata Tea	Mombasa; Dar Es Salaam (Direct); Belra; Mahe and Inland destinations in East Africa. (Carting at Timber Pond No. 4)	24/4
	Arebee	Mombasa and Dar Es Salaam (Direct); Seychelles; Nacala; Maputo; Kampala; Jinja. Also inland destinations in East Africa. (Carting at M-Jetha C.D.)	
Kalidas	S.C.I.	Colombo, Chittagong	30/4
Michail Vladimirskiy	Transocean	Singapore; Main Japan Ports.	19/4
Maribor (Yug)	Depe	Singapore; Hongkong; Keelung; Kaohsiung; Yokohama; Kobe; Busan	20/4
Lhotse	Marine Trans/	Singapore; Hongkong; Busan; Kobe; Tokyo; Djakarta. (Cart. at T.P. 3)	19/4
	M.C.S.	Singapore; Hongkong; Keelung; Kaoshiung; Jakarta; Surabaya; Bangkok; Penang; P. Keelang; Kobe; Yokohama. (Cart. at 7W/H-PD)	
Vega (Voy-01)	O.S.A./ Tata Tea/	P. Keelang; Singapore; Kaohsiung; Hongkong; Bangkok; Kobe; Yokohama; Nagoya; Moji; Osaka; Busan; Tokyo; Simizu; Keelung; Tsingtao; Quindao; Xiangang; Shanghai. (Carting at M-178-180 C.D. for O.S.A.) (Carting at Timber Pond No. 4 for Tata Tea).	20/4
	M.S.P.L.	Singapore; Bangkok; P. Kelang; Penang; Jakarta; Manila; Hongkong; Keelung; Kaohsiung. (Carting at Hay Bunder No. 4).	
Kalidas	S.C.I.	Singapore and other Far East Ports.	30/4
Robert E Lee	Samarth	Singapore. (Carting at P/Q-PD)	24/4
S/o. Nagaland	S.C.I.	Main Japan Ports	30/4
Lhotse	M.C.S.	Sydney; Melbourne; Brisbane; Burnie; New Castle. (Cart. at 7-W/H-PD)	19/4
Vega	O.S.A.	Sydney; Melbourne; Adelaide; Brisbane; Fremantle; Auckland; Wellington; Lyttelton; P. Chalmers. (Carting at M-178/180 C.D.)	20/4
Kalidas (Ind)	S.C.I.	Melbourne; Fremantle; Adelaide; Sydney.	30/4
Oyster Bay (V-4040)	Arebee	Lagos/Apapa; P. Harcourt; Abidjan; Tema; Takoradi; Monrovia; Lome; Freetown; Cotonou; Douala; Matadi. (Carting at M-Jetha C.D.)	24/4
Orient Triumph (V-307)	Transworld	Monrovia; Lome; Lagos; Douala; Tema; Takoradi; Abidjan; San Pedro. (Carting at M-178/180 Cotton Depot).	26/4
Nedlloyd Everest	Patvolk/ Trident/T.Tea S.W. & Co.	West African ports	4/5

VESSELS DUE IN BOMBAY FOR IMPORT DISCHARGE

Date	Steamer's Name	Agents	From
	Kapitan Kud	Transocean	U.K. Cont.
	Kalidas	S.C.I.	Australia/Singapore
	Robert E Lee	Samarth	U.S.A
	S/o. Haryana	S.C.I.	U.K. Cont
	S/o. Nagaland	S.C.I.	Japan/Far East
	Vishva Mohini	S.C.I.	U.K. Cont

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ETHYLENE DICHLORIDE
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HYDROXYLAMINE HYDROCHLORIDE
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ISO BUTYL ALCOHOL
ISO PROPYL ALCOHOL
LITHIUM HYDROXIDE
MAGNESIUM OXIDE
MALONIC ACID
METHYL CELLULOSE 4000
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Phone: 321020 339968 344937
Resi: 6124644 6122149

Materials Exported

BOMBAY

(From 5-8-89 to 6-8-89)

ACETIC ACID : To Odessa : Jsha Intercontinental, 7,500 kgs., Rs. 13,65,000.

CALCIUM HYPOCHLORITE: To Damman: Shriram Foods & Fertilizer 20 MTs., Rs. 95,200.

FURAZOLIDONE 50%: To Odessa : Seva Enterprises, 10,000 kgs., Rs. 5,80,000.

GAMMA ACID : To Karachi : Jindal Dye Intermediate, 4,986 kgs., Rs. 4,43,715; To New York: Omniana Exports Pvt. Ltd., 4,000 kgs., Rs. 3,55,000.

H-ACID: To Odessa: Zenith Ltd., 19,200 kgs., Rs. 12,69,444; To Shanghai: Espee Chemicals, 15,450 kgs., Rs. 15,41,614.

HYDROCHLORIC ACID : To Bahrain: Muhi Trading Corporation., 34 MTs., Rs. 58,968.

METHYLENE CHOLORIDE: To Odessa: Gujarat Alkalies & Chemicals, 36 MTs., Rs. 2,16,000.

SODIUM PENTACHLORO PHENATE: To Singapore: Chika Ltd., 15,000 kgs., Rs. 3,27,915.

SODIUM SULPHATE : To Sudan: Grasim Indus. Ltd., 200 MTs., Rs. 3,10,954.

ZINC PHOSPHIDE TECHNICAL: To Sudan: Voltas Inter Ltd., 3,000 kgs., Rs. 11,56,900.

DRUG MATERIALS IMPORTED BOMBAY

(From 30-1-89 to 31-1-89)

LACTOSE BP/USP: From FRG: Cadila Laboratories Pvt. Ltd., 5,000 kgs., Rs. 79,528.

PARACETAMOL BP-80 : From China: Falma Laboratories Pvt. Ltd., 5,250 kgs., Rs. 4,00,104.

PENCILLIN G. POTASSIUM: From UK: Cadila Laboratories Pvt. Ltd., 3,000 kgs., Rs. 6,76,516.

SULPHADIAZINE BP : From China: N.R Jet Pharmaceuticals Ltd., 500 kgs., Rs. 1,16,221.

SULPHADIAZINE BP 80 : From China: Pharmapak Pvt. Ltd., 2,000 kgs., Rs. 3,98,636.

DYE MATERIALS IMPORTED BOMBAY

(From 30-1-89 to 31-1-89)

DYESTUFFS: From China : Blue Chip Dyestuffs Ind.. Ltd., 3,000 kgs., Rs. 1,28,083.

SAMARON BRILLIANT YELLOW HRL: From FRG: Avani Dyechem Inds., 200 kgs., Rs. 92,900.

SYNTHETIC ORGANIC DYESTUFF NIGROSINE BASE: From Japan: Joshi Formulabs (P) Ltd., 750 kgs., Rs. 1,02,569.

PLASTIC MATERIALS IMPORTED BOMBAY

(From 30-1-89 to 31-1-89)

BUTYL ACRYLATE MONOMER: From FRG: Parshwanath Chemicals, 2,520 kgs., Rs. 71,058.

DI METHYLAMINO ETHYL METHACRYLATE: From USA : R.S.A. Polymers, 818 kgs., Rs. 69,488.

CAPROLACTAM: From BELgium: Garware Nylons Ltd., 177.500 MTs., Rs. 51,13,329; J.K. Synthetics Ltd., 496.10 MTs., Rs. 1,43,17,322; From Netherlands: The National Rayon Corpn., Ltd., 153 MTs., Rs. 44,07,546.

HIGH DENSITY POLYETHYLENE BLOW MOULDING: From Czechoslovakaia: D. Jamnadas & Co., 25 MTs., Rs. 3,32,476.

HIGH DENSITY POLYETHYLENE: From Singapore: Multifilms Plastics Pvt. Ltd., 34 MTs., Rs. 6,21,876; From Yugoslavia: Equipment Produce, 400 MT., Rs. 61,03,529.

LOW DENSITY POLYETHYLENE: From Sweden: Universal Cables Ltd., 105 kgs., Rs. 2,115.

PVC RESIN: From FRG: Finolex Cables Ltd., 50 MTs., Rs. 9,49,019; From Korea: AMC Coated Fab Pvt. Ltd., 25 MTs., Rs. 5,12,214; Caprihans India Ltd., 1,50,000 kgs., Rs. 26,26,904; Sanghi Leathers (P) Ltd., 25 MTs., Rs. 5,04,536; From Saudi Arabia: Roto Screentech Pvt. Ltd., 30 MTs., Rs. 6,07,797.

POLYPROPYLENE: From Australia: The Supreme Industries Ltd., 79.75 MTs., Rs. 13,85,122; From Brazil: Gujarat Polyweave Ltd., 200 MTs., Rs. 38,82,596; From Czechoslovakia: Associated Brothers, 238 MTs., Rs. 30,74,249; Jyemco, 28 MTs., 2,61,794; From Hungary: Alpha Packaging, 90 MTs., Rs. 17,83,321; From Italy: Sun Vacuum Formers Pvt. Ltd., 43.30 MTs., Rs. 6,99,610: The Supreme Industries Ltd., 58.044 MTs., Rs. 14,51,029; From Portugal: Ganapati Plast Fab Ltd., 29 MTs., Rs. 4,71,283; From USA: MP United Polypropylene Ltd., 15 MTs., Rs. 3,01,793.

POLYPROPYLENE HOMOPOLYMER: From FRG: Gujarat Polyweave Ltd., 1,47,950 kgs., Rs. 31,44,335.

POLYSTYRENE: From Japan: Peico Electricals Ltd., 5,000 kgs., Rs. 1,74,585; From Korea: Cello Plastic Indl. Works. 34 MTs., Rs. 7,35,522; Manoj Enterprises 17 MTs., Rs. 3,62,761; Uniplast Industries, 34 MTs., Rs. 7,25,522; Verma Extrusions Pvt. Ltd., 102 MTs., Rs. 21,86,567.

POLYVINYL CHLORIDE: From USA: Hindustan Ferodo Ltd., 1,587 kgs., Rs. 42,144.

MATERIALS IMPORTED

BOMBAY

(From 30-1-89 to 31-1-89)

ACRYLIC ACID: From Japan: Thermax Pvt. Ltd., 48,000 kgs., Rs. 13,38,116.

ACETANILIDE: From FRG: Vision Intermediates Pvt. Ltd., 45,000 kgs., Rs. 10,80,281; From Japan: Chemical Industries, 32 MTs., Rs. 7,80,392.

ACETANILIDE 99.5% MIN: From Hungary: Sandoz India Ltd., 28.520 MTs., Rs. 6,52,055.

ACETIC ANHYDRIDE: From Japan: Metroni Drugs Pvt. Ltd., 16,000 kgs., Rs. 2,65,822; Vipul Dyes & Chemicals P. Ltd., 1,76,000 kgs., Rs. 28,43,555.

4-AMINODIPHENYLAMINE (p-AMINODIPHENYLAMINE): From FRG: Bayer (I) Ltd., 14,400 kgs., Rs. 12,51,063.

ANILINE OIL: From UK: Polyolefins India Ltd., 57,600 MTs., Rs. 13,34,473.

ANTIOXIDANT: From Korea: Ravindarkumar Vijaykumar 5 MTs., Rs. 1,37,178.

AROMATIC CHEMICALS: From Japan: Hindustan Lever Ltd., 3,000 kgs., Rs. 13,49,855.

ARSENIC TRIOXIDE: From Korea: Sultanchand Bimalprakash, 5.999 MTs., Rs. 45,445.

2B-ACID SODIUM SALT: From Japan: Colour Chem Ltd., 2,500 kgs., Rs. 2,53,098.

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BENZALDEHYDE: From Netherlands: Kantilal Manilal & Co., 15,600 kgs., Rs. 3,87,575

BUTENEDIOL: From FRG: Excel Inds. Ltd., 13,650 kgs., Rs 9,25,841.

BUTYL ETHANOL: From UK : Kantilal Manilal & Co., 9,620 kgs., Rs. 1,83,682.

BUTYL TITANATE: From UK: Dr. Beck & Co (I) Ltd., 5,200 kgs., Rs. 2,49,664.

CALCIUM SULPHATE: From USA: Fulford (I) Ltd., 1995.81 kgs., Rs. 78,466.

CAUSTIC POTASH FLAKES 95/96%: From France: Indian Dyestuff & Chemicals, 7211.87 kgs., Rs. 75,846.

CETYL ALCOHOL: From FRG: Ashok Chemicals, 2000 kgs., Rs. 61,293.

CHLORDANE TECHNICAL : From USA: Rallis India Ltd., 13,120 kgs., Rs. 3,99,952.

COAL TAR: From Japan: Indian Aluminium Co. Ltd., 800 MTs., Rs. 36,33,706.

COBALT OCTATE: From Belgium: U.K. Paint Inds., 6.800 MTs., Rs. 4,41,448.

CRUDE NAPHTHALENE : From Australia: Atic Inds. Ltd., 69.12 MTs., Rs. 6,00,512.

3-CYANOPYRIDINE : From Japan: Khojchem Pvt. Ltd., 2,000 kgs., Rs. 1,28,029.

CYANURIC CHLORIDE : From FRG: Amardeep Dye Chem, 1000 kgs., Rs. 43,010; Anil Industries, 3,000 kgs., Rs. 1,29,030; Atlantic Colour Inds., 4,000 kgs., Rs. 1,72,038; Dyes India, 500 kgs., Rs. 21,505; Hina Dyechem Industries, 1,000 kgs., Rs. 43,010; Jay Chemical Inds., 12,000 kgs., Rs. 5,67,726; Jyoti Chemical Inds., 1,000 kgs., Rs. 43,010; Khushboo Industries, 500 kgs., Rs. 21,505; Khyati Chemical Inds., 1,000 kgs., Rs. 43,010 kgs., Laxmi Traders, 500 kgs., Rs. 21,505; Mangalam Chemicals, 1000 kgs., Rs. 43,010; Mohita Dyechem Pvt. Ltd., 1,000 kgs., Rs. 43,010. Prakash Chemicals, 4 MT., Rs. 1,76,038; Shreeji Industries, 500 kgs., Rs. 21,505; Shyam Dyes & Chemicals Inds., 1,000 kgs., Rs. 43,010; The Textile Colour & Chemical, 1000 kgs., Rs. 43,010; Vrindavan Dye Chem, 1000 kgs., Rs. 43,010.

CYCLOHEXANONE : From FRG: Evid and Company chemicals Ltd., 45,600 kgs., Rs. 11,06,138; From Taiwan: National Organic Chemical Inds., 45.6 MTs., Rs. 10,42,557.

DL MALEIC ACID: From Japan: Pioma Industries, 35 MTs., Rs. 7,91,694.

DESMODUR: From FRG: Converter Adhesives & Chem Pvt. Ltd., 4,000 kgs., Rs. 1,45,104.

4,4 DIAMINO DIPHENYL METHANE: From Japan: Dr. Beck & Co (I) Ltd., 9,000 kgs., Rs. 4,58,176.

DICHLORO NAPHTHOQUINONE: From Japan: Ideal Dye Chem Inds., 1,000 kgs., Rs. 1,56,872.

2,4 DICHLORO TOLUENE: From FRG: Priya Chemicals, 5,280 kgs., Rs. 5,54,102.

DIETHYL THIOPHOSPHORYL CHLORIDE: From USA: Gujarat Insecticides Ltd., 32,386 kgs., Rs. 11,15,629.

DIETHYLENE DIAMINE: From Sweden: Parag Pharmaceuticals (I) Pvt. Ltd., 9,120 kgs., Rs. 4,37,867; Satyam Pharma Chem Pvt. Ltd., 5979.87 kgs., Rs. 2,87,104.

DIHYDRO MYRECENOL: From UK: Mysore Fine Agarbathi Factory, 2,100 kgs., Rs. 2,32,060.

DI-ISOPROPYLAMINE : From FRG: Cheminor Drugs Pvt. Ltd., 140 kgs., Rs. 13,789.

DIMETHYL ACETAMIDE: From FRG: JK Synthetics Ltd., 44.460 MTs., Rs. 9,56,104.

DIMETHYL FORMAMIDE : From FRG: Atul Products Ltd., 5,130 kgs., Rs. 1,00,612.

DIMETHYL SULFOXIDE: From USA: Zora Pharma Pvt. Ltd., 5000 Lbs., Rs. 60,968.

4-6 DINITRO ORTHO SEC. BUTYL PHENOL: From France : Polychem Ltd., 5 MTs., Rs. 2,89,873.

2-ETHOXY -5-ACETYL AMINO NN BIS HYDROXY ETHYL ANILINE : From Japan : Atul Products Ltd., 600 kgs., Rs. 1,94,793.

ETHOXY PROPYLAMINE : From FRG: Nirup Synchrome Ltd., 850 kgs., Rs. 72,385.

ETHYL BENZYL ANILINE: From FRG: Ravi Chem Dye, 6,000 kgs., Rs. 5,29,018.

2-ETHYL HEXYL ACRYLATE: From FRG: Siddhi Vinayak chemicals & Pvt. Ltd., 3,780 kgs., Rs. 1,08,316.

ETHYL ORTHO FORMATE: From Japan: Ranbaxy Lab Ltd., 1,080 kgs., Rs. 1,38,507.

ETHYL VANILLIN: From France: Naarden India Ltd., 1,000 kgs., Rs. 3,65,810.

FUMARIC ACID : From Italy Shri Ambuja Petrochemicals Ltd., 17,500 kgs., Rs. 2,93,410.

GAMMA FERRIC OXIDE: From FRG: Jai Electronic Inds. Pvt. Ltd., 12,000 kgs., Rs. 6,31,381.

GLYOXYLIC ACID 50% : From France: E. Merck (India) Ltd., 250 kgs., Rs. 19,053.

HYDROXYLAMINE SULPHATE: From Japan: Atic Industries Ltd., 5,000 kgs., Rs. 1,58,950.

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ISOPHTHALIC ACID : From USA: Bakelite Hylam Ltd.. 16,329 kgs., Rs. 2,32,601.

LINALOOL 90 : From USA : Calcutta Perfumery Works Pvt. Ltd., 907 kgs., Rs. 93,316.

L-LYSINE MONO-HYDROCHLORIDE: From Japan: Cyanamid India Ltd., 1,000 kgs., Rs. 83,831.

MANGANESE CARBONATE : From FRG: Cosmo Ferrites Ltd., 25,000 kgs., Rs. 2,24,169.

META TOLUENE DIAMINE : From FRG: Bharat Texdyes Inds., 1,000 kgs., Rs. 40,862.

META TOLUENE DIAMINE CRUDE: From Japan: Reliance Dye chem, 1,000 kgs.. Rs. 42,795.

METHYL ACETYLENE : From UK: Bhabha Atomic Research Centre, 2 Nos., Rs. 15,574.

METHYL CHLORIDE : From France: Armour Chemicals Ltd., 1,17,895.50 kgs., Rs. 11,15,136.

METHYLENE BIS THIOCYANATE: From Isreal : Aquapharm Chemical Co. Pvt. Ltd., 1,820 kgs., Rs. 2,44,672.

METHYLENE CHLORIDE: From Netherlands: Gujarat Lyka Organics Ltd., 38,880 kgs., Rs. 3,56,362.

MICRO CRYSTALLINE WAX : From Spain: S.J. International, 21 MTs., Rs. 2,43,064; Sunidhi, 5,000 kgs., Rs. 61,731.

MOLYBDENUM TRIOXIDE : From UK: Mahindra Sintered Products Ltd., 150 kgs., Rs. 35,252.

MORPHOLINE: From FRG: Polyolefins Ind. Ltd., 31,200 MTs., 9,98,660.

NAPHTHALENE CRUDE: From Australia: Amal Rasayan Ltd., 68.90 MTs., Rs. 5,77,598; Atul Products Ltd., 85.67 MTs., Rs. 7,18,183; From Canada: Kamdhenu Agro Chem Inds., 30,000 kgs. Rs. 2,94,933; Sajjan Impex Pvt. Ltd., 30,000 kgs., Rs. 2,85,788; From Spain: BASF India Ltd., 64,800 kgs., Rs. 6,17,304; From Yugoslavia: Sudarshan Chemical Inds., Ltd., 40,360, kgs., Rs. 3,62,950; Nitin Rasayan Chemical, 15,000 kgs., Rs. 1,42,894.

N-CHLOROSUCCINIMIDE : From Austria: Ranbaxy Laboratories Ltd., 1,000 kgs., Rs. 1,84,299.

NEOPENTYL GLYCOL : From FRG: Sekhsaria Chemicals Pvt. Ltd., 15,000 kgs., Rs. 3,22,571.

NITRO AMINO PHENOL: From Japan: BASF India Ltd., 1,000 kgs., Rs. 1,68,882.

N-METHYLPIPERIDONE: From FRG: Boehringer Knall Ltd., 450 kgs., Rs. 1,74,963.

N-METHYL 2-PYRROLIDONE: From USA: Atlas Wires Pvt. Ltd., 2,086.60 kgs., Rs. 1,30,129.

N-N DIETHYL ETHYLENE DIAMINE: From Sweden: Wallace Pharmaceuticals Ltd., 320 kgs., Rs. 77,456.

OCTOIC ACID: From FRG: Aryavart Chemicals Pvt. Ltd., 14.430 MTs., Rs. 2,37,080.

OLEYL CETYL ALHOHOL : From FRG: Unitop Chemicals Pvt. Ltd., 8.5 MTs., Rs. 2,37,628.

ORTHO TOLUIDINE LIQUID: From FRG: Ravi Chem Dye, 28,800 kgs., Rs. 6,06,925.

PARACHLOROTOLUENE : From USA: Gujarat Insecticides Ltd., 24,494 kgs., Rs. 6,09,072.

PARAFORMALDEHYDE PRILL : From Spain: Jadavji and Co., 18,000 kgs., Rs. 1,42,665.

PARA NITRO TOLUENE: From Japan: Hickson & Dadajee Ltd., 15,480 kgs., Rs. 6,39,801.

PERCHLOROETHYLENE: From FRG: Greatway Ltd., 9,900 kgs., Rs. 1,10,707; Hind Woollen & Hosiery Mills, 6,930 kgs., Rs 78,329.

PIVALOYL CHLORIDE : From FRG: Kopran Chemical Co. Ltd., 3,060 kgs., Rs. 1,96,493.

POLYCARBONATE : From Netherlands: P.E. & E Ltd., 3,000 kgs., Rs. 2,95,696.

POLYETHER POLYOL : From USA: Tirupati Foams Pvt. Ltd., 16.380 kgs., Rs. 3,17,074.

POLYETHYLENE GLYCOL : From USA: Procter and Gamble India Ltd., 15,928 Lbs Rs. 2,92,312.

POLYVINYL ALCOHOL : From Japan: Anil Synthetics Pvt. Ltd., 1,000 kgs., Rs. 45,726; Blue Blends Lessing Pvt. Ltd., 3,000 kgs. Rs. 1,28,033; Delight Handicrafts Palace, 11.12 MTs., Rs. 4,74,577., From Japan: General Pharm Pvt. Ltd., 1,000 kgs., Rs. 42,678; K.J. Tex Pvt. Ltd., 1,500 kgs., Rs. 68,590; Meghdoot Plastic Corpn., 12,000 kgs., Rs. 5,48,714; Nivi Trading Ltd., 4,000 kgs., Rs. 1,70,612; P. K. and sons, 1 MT., Rs. 45,727; Rabbani Textiles, 1000 kgs., Rs. 45,727; Shahab Bros. Inds., 3.26 MTs., Rs. 1,39,130.

PROPIONIC ACID : From FRG: Jaysynth Dyechem Pvt. Ltd., 2,100 kgs., Rs. 36,128.

3-PROPIONYLAMINO-NN DIMETHYL ANILINE: From Japan: Serene Dyestuff Inds. Ltd., 759.3 kgs., Rs. 2,85,502.

PYRIDINE 2° : From Japan: Euresean, 1,170 kgs., Rs. 81,705.

PYRIDINIUM-N-PROPYL SULPHOBETAINE: From FRG: Grauer & Weil (I) Ltd., 1,000 kgs., Rs. 1,99,995.

POLYPROPYLENE GLYCOL : From Taiwan : Hico Products Ltd., 16.8 MT., Rs. 3,20,082.

SODIUM CYANATE: From Japan: Montari Industries Ltd., 49,560 kgs., Rs. 8,36,232.

SODIUM PICRAMATE: From ance: BASF India Ltd., 964 s., Rs. 1,53,448.

SORBITOL: From USA: Procter Gamble India Ltd., 3,13,734 s., Rs. 18,71,638.

TANNIC ACID BP: From China: rvodaya Enterprises, 1,000 s., Rs. 99,074.

TERTIARY AMYL ALCOHOL)% MIN: From Netherlands: mphor & Allied Products Ltd., 120 kgs., Rs. 3,82,393.

TERTIARY BUTYL HYDROUINONE: From UK : Ahmed omerbhoy, 8,000 kgs., Rs. 3,5,062.

THIOPHENOL: From USA : ne Boots Co., (India) Ltd., 1,20.595 kgs., Rs. 1,08,114.

TEIMELLITIC ANHYDRIDE : rom USA: Dr. Beck & Co (I) d., 16,329 kgs., Rs. 5,65,175.

TRIMETHYL MONOCHLOROILANE: From FRG: Reliance Silione (I) Pvt. Ltd., 12,249 kgs., s. 7,42,277.

TRIMETHYL PHOSPHITE : rom USA: Sudarshan Chemical nds., 15,513.048 kgs., Rs. 5,3,739; From FRG: Nocil, 86,00 kgs., Rs. 28,70,872.

ZINC OXIDE: From France: JK. ndustries Ltd., 28 MTs., Rs. 5,5,806.

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(From 2-2-89 to 8-2-89)

ACETANILIDE: From Hungary: Sunbeam Monochem Pvt. Ltd., 76,000 kgs., Rs. 17,26,270; Sagar Drugs and Pharmaceuticals, 22,588 kgs., Rs. 7,25,396.

ACETO METHYL ESTER: From Japan: Gupta Trading Company, 10.6 MTs., Rs. 2,48,843; Acetyl Sulfonyl Chloride: From Japan: Metropolitan Industries 1,050 kgs., Rs. 45,648.

ALDRIN TECH : From Netherlands: Gayatri Pestichem, 23,400 kgs., Rs. 25,19,714.

AMMONIUM ADIPATE: From Japan: Uptron India Ltd., 300 kgs., Rs. 27,708.

AMINOPYRIMIDINE: From Netherlands: May and Baker India Ltd., 5,000 kgs., Rs. 20,10,046.

AROMATIC CHEMICALS : From FRG: Calcutta Perfumery Works Pvt. Ltd., 250 kgs., Rs. 45,160; Quest International India Ltd., 10 kgs., Rs. 72,590.

ARSENIC TRIOXIDE : From Belgium: Banaras Bead Mfg. Co., 1,875 kgs., Rs. 27,311.

ANTIOXIDANT: From Korea: Zenith Rubber and Plastics Works, 1,320 kgs., Rs. 36,624.

ANTIMONY OXIDE : From USA: Nocil, 907 kgs., Rs. 63,240.

ANTIMONY TRIOXIDE: From UK: Cable Corporation of India Ltd., 2000 kgs., Rs. 1,29,254; From Belgium: Orkay Silk Mills Ltd., 3,000 kgs., Rs. 2,39,962.

BENZOTRIAZOLE: From UK: Indrol Lubricants & Specialities, 1000 kgs., Rs. 2,24,025.

BETA NAPHTHOL : From China: Priya Chemicals, 16,000 kgs., Rs. 6,82,844.

BETA PICOLINE: From USA: Lasons Engg. Co. Pvt. Ltd., 9,264 kgs., Rs. 3,17,705.

BISPHENOL-A : From USA: Dr. Beck & Co (I) Ltd., 25,000 kgs., Rs. 8,00,208.

BROMINE : From Netherlands: Amar Dyechem Ltd., 11,340 kgs., Rs. 2,85,194.

BROMINE LIQUID : From Netherlands: Gujarat Insecticides Ltd., 22,680 kgs., Rs. 5,56,561.

BROMOCHLORO DIFLUOROMETHANE: From UK : Newage Industries, 4,680 kgs., Rs. 2,31,832.

BUTYL ACRYLATE : From FRG: BASF India Ltd., 28,080 kgs., Rs. 7,40,434; Chemical Corpn., 7,020 kgs., Rs. 1,97,949; Mehra Chemicals, 3,960 kgs., Rs. 1,11,663; Sajan Polymers, 3,780 kgs., Rs. 1,06,588; From Taiwan: Hitech Polymers, 7,020 kgs., Rs. 1,87,249.

CALCIUM CYANAMIDE POWDER: From FRG: German Remedies Ltd., 18,000 kgs., Rs. 2,11,194.

CALCIUM OCTOATE : From France: Usha Intercontinental, 2.400 MTs., Rs. 52,201.

CARBOZOLE TECH PURE : From FRG: Dipen Industries, 1,000 kgs., Rs. 58,063.

CARBON BLACK: From Australia: PIX Transmissions Pvt. Ltd., 34,691 kgs., Rs. 3,27,696; From FRG: Sandvik Asia Ltd., 2,400 kgs., Rs. 70,192; Sigma Paints Ltd., 600 kgs., Rs. 1,06,578; From Mexico: Modi Rubber Ltd., 2,54,016 kgs., Rs. 28,87,200., From Thailand: Ceat Tyres of India Ltd., 90,150 kgs., Rs 8,39,836.

CAUSTIC SODA : From Czechoslovakia: Vipul Dyes and Chemicals, 20,000 kgs., Rs. 2,41,800.

CETO STEARYL ALCOHOL : From FRG: Wax Oils Pvt. Ltd., 5 MTs., Rs. 1,07,524.

CETYL CHLORIDE: From USA: Raw Pharma & Fine Chemicals Pvt. Ltd., 174 kgs., Rs. 10,396.

2 CHLORO-4-AMINO TOLUENE 5-SULPHANIC ACID : From Japan: Indian Dyestuff Inds. Ltd., 4.500 MTs., Rs. 4,47,212.

CHLORO TOLUDINE SULPHONIC ACID : From Korea : Goodlass Nerolac Paints Ltd., 3,000 kgs., Rs. 2,05,768.

CINNAMIC ALDEHYDE: From USA: Clovex Aromatics, 1000 kgs., Rs. 59,444.

CITRIC ACID MONOHYDRATE: From China: Hindustan Pharmaceuticals, 18.491 kgs., Rs. 52,422.

COCO IMIDAZOLINE AMINE: From USA: PRM Pharma & Fine Chemicals Pvt. Ltd., 780 kgs., Rs. 62,060.

CYANO NITRO ANILINE: From Japan: Nirup Synchrome Ltd., 800 kgs., Rs. 2,74,862.

CYANOPYRIDINE: From Japan: Tata Exports Ltd., 7,300 kgs., Rs. 5,00,702.

CYANURIC CHLORIDE: From FRG: Jay Chemical Industries, 6000 kgs., Rs. 2,83,863.

CYCLOHEXANONE : From FRG: Evid and Company Chemicals Ltd., 58,900 kgs., Rs. 14,28,762; Nova Magnetics Ltd., 14,820 kgs., Rs. 3,50,571; From Italy: Montari Chemicals Pvt. Ltd., 28,880 kgs., Rs. 6,63,801.

D-ALPHA PHENYL GLYCINE BASE: From Taiwan: Armour Chemicals Ltd., 9,000 kgs., Rs. 20,09,665.

DL-METHIONINE: From France: Tarapur Inorganics Pvt. Ltd., 2,500 kgs., Rs. 1,18,126.

DL-2 AMINO 1 BUTANOL : From FRG: Cadila Laboratories Pvt. Ltd., 10,140 kgs., Rs. 13,07,559.

2,3 DICHLORO 1,4 NAPHTHOQUINONE : From Japan: Jindal Dye Intermediate Pvt. Ltd., 7,900 kgs., Rs. 10,75,666.

3,4 DICHLORO NITRO BENZENE: From FRG: Sudarshan Chemical Industries, 6,000 kgs., Rs. 2,70,960.

DIETHYL METHYL MALONATE: From Switzerland: FDC Limited, 500 kgs., Rs. 1,30,970.

DIETHYLENE DIAMINE: From Sweden: Mehta Pharmaceuticals Inds., 9.1424 MTs., Rs. 4,38,943

DIETHYLENE GLYCOL: From Saudi Arabia: Reliance Industries Ltd., 7,194 MTs., Rs. 1,12,532.

DIMETHYL C-12/C-14 AMINE: From FRG: Flame Pharmaceuticals Pvt. Ltd., 960 kgs., Rs. 38,337.

DIMETHYL FORMAMIDE : From FRG: Aquapharm Chemical Co. Pvt. Ltd., 14,820 kgs., Rs. 2,89,381; From FRG: Rallis India Ltd., 14,820 kgs., Rs. 2,86,831; From Japan: The Bhoir Inds. Ltd., 30.400 MTs., Rs. 5,09,695.

DIMETHYL SUCCINYL SUCCINATE : From Austria; Sudarshan Chemical Inds., 400 kgs., Rs. 77,417.

DIMETHYL SULPHOXIDE · From Japan: New Generic Drug House Ltd., 5,060 kgs., Rs. 1,38,825; Ranbaxy Laboratories Ltd., 1,100 kgs., Rs. 30,179; From USA: Globe Organics Ltd., 70,000 Lbs., Rs. 8,00,208; Pragati Pharmaceutical Pvt. Ltd., 2,041 Lbs., Rs. 54,871.

DIMETHYL TEREPHTHALATE: From Mexico : India Polyfibres Ltd., 250 MTs., Rs. 28,06,716.

1,3 DIMETHYL UREA: From FRG: Pefco Industries Ltd., 7,500 kgs., Rs. 1,46,324.

DIMETHYL UREA: From FRG: Trichem Laboratories, 7000 kgs., Rs. 1,69,802.

DIOCTYL PHTHALATE PLASTICIZER : From Italy: Royal Cushion Products Pvt. Ltd., 32,800 kgs., Rs. 5,19,229.

DIPHENYLAMINE : From UK: Bayer India Ltd., 48.8222 kgs., Rs. 3,13,300.

DIPHENYL METHANE DI ISOCYANATE: From FRG: Gargi Metallurgical Corpn., 18 MTs., Rs. 6,44,739; United Metachem Pvt. Ltd., 18,000 kgs., Rs. 6,44,739.

DIPHENYL OXIDE : From China: DWO Pharmaceuticals, 7,200 kgs., Rs. 1,51,889.

DIPHENYL OXIDE : From USA: Cipla Ltd., 4,955.58 kgs., Rs. 1,49,556; Nirma Detergents Pvt. Ltd., 15513.120 kgs., Rs. 37,436.

DI-TERTIARY BUTYL PER OXIDE TECH/PURE/LIQUID : From UK : Mc Dowell & Co. Ltd., 2,000 kgs., Rs. 1,65,497.

ERYTHROMYCIN THIOCYANATE: From USA: Chemifine, 1,326.7 kgs., Rs. 12,52,047.

ETHYL ETHER : From FRG: Grauer & Weil (India) Ltd., 1,040 kgs., Rs. 91,249.

ETHYL HEXYL ACRYLATE: From FRG: Chemical Corporation, 7,020 kgs., Rs. 2,11,859; Indo Polymers, 1,800 kgs., Rs. 54,322.

ETHYL MERCAPTAN : From Netherlands: Pesticides India, 12,480 kgs., Rs. 2,75,059; Volrho Ltd., 12,480 kgs., Rs. 2,83,429.

ETHYL MONO CHLORO ACETATE: From UK : K.V. Arochem Ltd., 9,900 kgs., Rs. 3,74,798.

ETHYL THIOETHANOL : From Belgium: Cadila Laboratories Pvt. Ltd., 2,200 kgs., Rs. 75,448.

2-ETHYL THIOETHANOL : From Belgium: Chemo Research Lab Pvt. Ltd., 4,000 kgs., Rs. 65,300; Chemo Search Laboratories, 2000 kgs., Rs. 33,947; FDC Ltd., 3,526.90 kgs., Rs. 1,29,016.

ETHYL VANILLIN : From France: Kushalchand & Co., 1,000 kgs., Rs. 3,61,999.

ETHYLENE ACRYLIC ACID : From USA: Mazda Pockaging Ltd., 3 MTs., Rs. 1,02,882.

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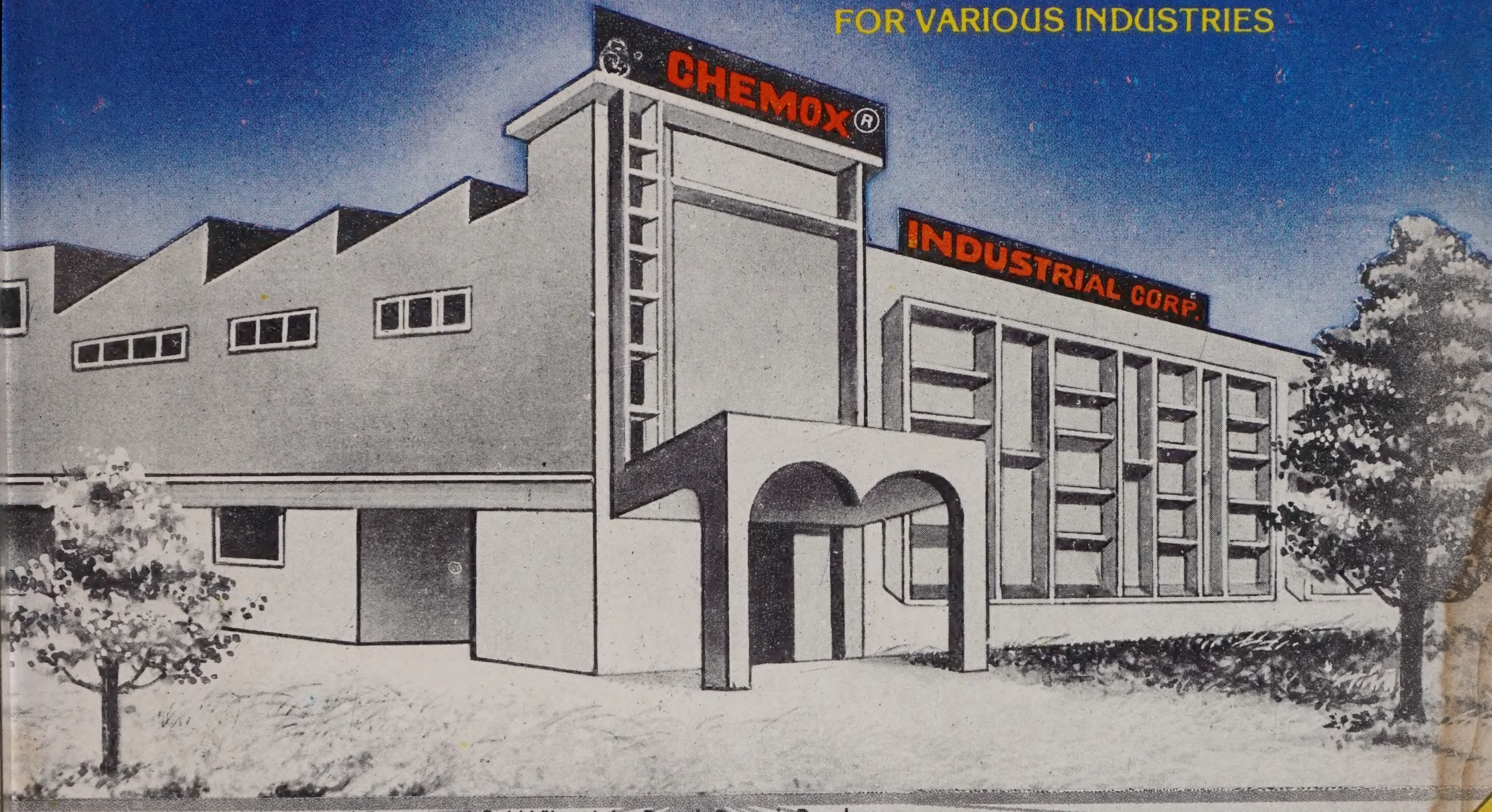

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